

Pigeon River Watershed Management Plan



A project for the LaGrange County Soil and Water Conservation District

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Written By:

SNRT, Inc
Natural Resource Associates

Lead Author: Kyle Quandt

Co-Author: David Arrington, Ph.D.

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1.0 Introduction

The LaGrange County Soil and Water Conservation District (SWCD) has been working with landowners and producers in LaGrange County to provide education on water quality issues and sustainable farming for the past 17 years. The relationship that has been formed between the SWCD and the farmers in the community has afforded the SWCD the ability to write comprehensive watershed management plans (WMP) for the Little Elkhart River and the Little Elkhart Addendum and begin implementation of those WMPs with full support and help from the community. Monthly water testing has shown improvements in water quality indicating that the SWCD's and local farmer's efforts to implement best management practices and improve water quality have made a difference in the watershed.

The success seen in the Little Elkhart watershed led the SWCD to look at surrounding watersheds to see if they could expand their efforts. Steuben County SWCD wrote a WMP for the portion of the Pigeon Creek watershed located within Steuben County (Figure 1). That WMP was approved by the Indiana Department of Environmental Management (IDEM) in 2006 and the Steuben SWCD is currently implementing that WMP. The Pigeon Creek flows southwesterly through Steuben County and enters the east side of LaGrange County. Pigeon Creek turns into the Pigeon River once the creek meets the Mongo Millpond. From there the river flows west by northwest up to St. Joseph County Michigan, then it curves southwesterly back to Elkhart County where it eventually meets the St. Joseph River. Since the Pigeon River Watershed is located not only in Steuben County but also in LaGrange and the northeast corner of Elkhart County, Indiana and St. Joseph County, Michigan, the SWCD began to investigate the Pigeon River to see if it was a good candidate for expanding their efforts.

The Pigeon River watershed project, including part of HUC 0405000110 and HUC 0405000111, has several waterbody segments listed as impaired on the 303(d) List of Impaired Waters in the Indiana Integrated Water Monitoring and Assessment Report (IR). The impairments include impaired biotic communities, phosphorus, dissolved oxygen, and *E. coli*. The watershed is approximately 155,000 acres comprised of mostly agricultural land. The majority of the rural area of the watershed is farmed by Amish (approximately 55%) who own small segments of land to raise livestock for transportation, production of income, and food. As was learned during the development of the Little Elkhart WMP, the unique lifestyle of the Amish community often leads to excess sediment and nutrients entering surface waters due to livestock with direct access to surface water and improper barnyard drainage.

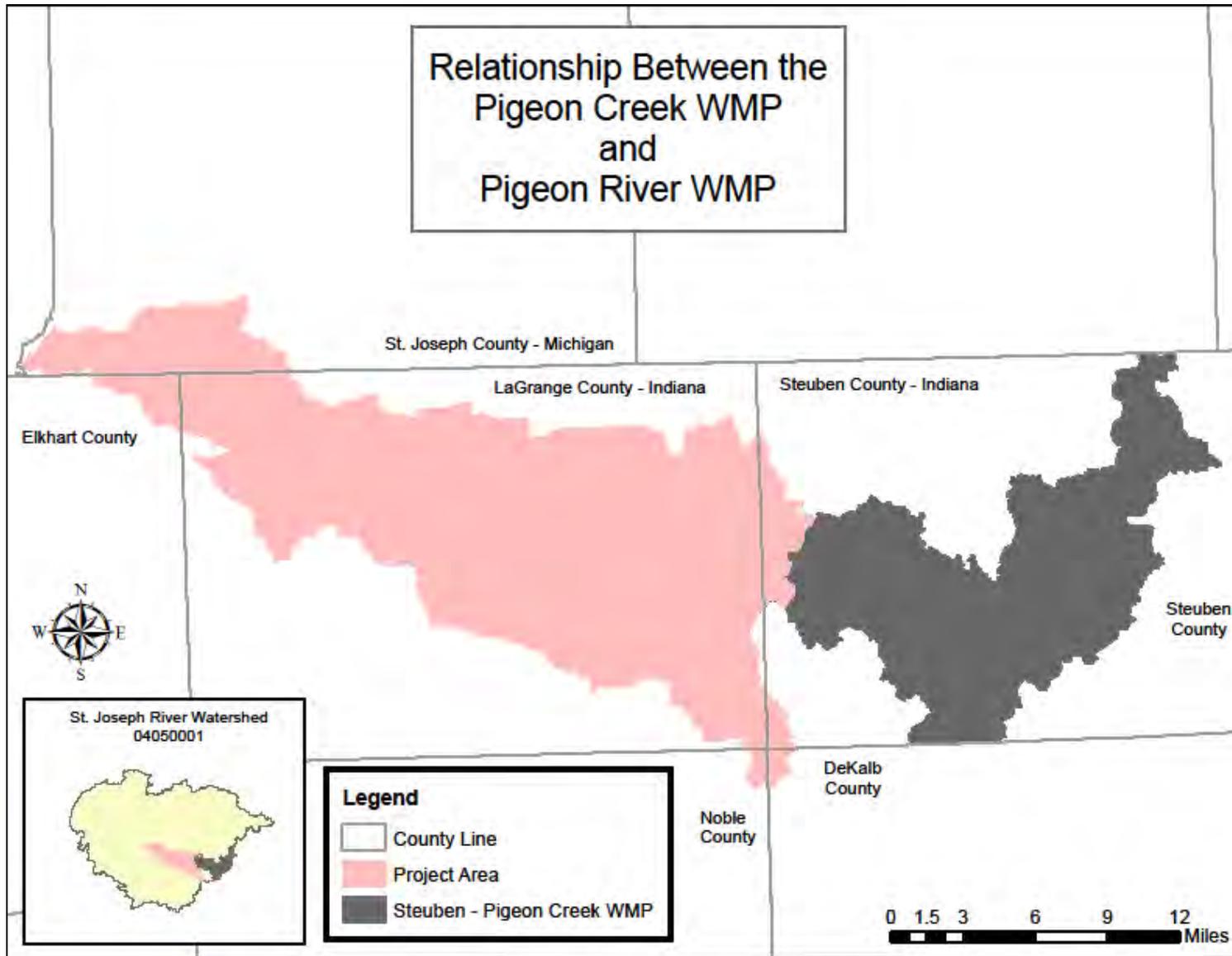


Figure 1: Relationship between Pigeon River and Pigeon Creek WMPs

There are five urban areas located within the watershed; LaGrange, IN (P=2927), Shipshewana, IN (P=529), Howe, IN (P=550), Mongo, IN (P=300) and White Pigeon, MI (P=1544). Historically in this area, urban lawns are over fertilized and there is a significant amount of horse manure on the streets from the Amish means of transportation, all of which will be transported into surface water by way of stormwater runoff.

Northeastern Indiana is often referred to as “Lake Country” as there are many lakes which were formed during the last glaciation. The lakes located within the Pigeon River Watershed are a great eco-service as they provide recreational opportunities such as boating and fishing. The lake system in the watershed is also a great revenue producer for the community as the lakes bring in thousands of tourists every year. The lakes within the watershed that are listed on the 303(d) list of impaired waters are primarily listed for impaired biotic communities. Most of the impairments to these lakes can be linked to over fertilization of lawns adjacent to the lakes and lakes that do not have a central sewer system as septic systems are a major contributor of nonpoint source pollution.

Another revenue source for the community and a great resource that must be protected is the Pigeon River Fish and Wildlife Area near Mongo, IN. This area encompasses over 11,000 acres of land and is a major recreation area as locals and tourists visit the area for canoeing, fishing, hunting, bird watching, and hiking.

After taking the above findings into consideration the SWCD met with several local organizations and agencies to present the above information and to collaborate on a project to write a WMP for the portion of the watershed that does not currently have one and begin implementation to delist the impaired waterways from the IDEM 303(d) list outlined in the IDEM Integrated Report which is submitted to the US Environmental Protection Agency (EPA) every two years. A collaborative effort between the Steuben County SWCD, The Nature Conservancy, Pheasants Forever, Shipshewana Lake Association, Indiana Department of Natural Resources (IN DNR), Friends of the St. Joe, and the St. Joseph River Basin Commission led to an application for funding to be submitted to IDEM through the CWA§319 grant program in September, 2009. The application was approved and the project began in September, 2010.

The SWCD sent invitations to local landowners, producers, and city and county planners, and sent press releases to local publications to encourage the public to attend the project kick-off meeting which was held in December, 2010. The purpose of the meeting was to inform the stakeholders in the watershed about the project and to gather support for the project. It was also intended to be a platform for stakeholders to voice any questions or concerns regarding the project itself, or water quality and for the SWCD to recruit steering committee members for the project. Table 1 below is a list of those individuals who have committed to be on the steering committee for this project.

Table 1: Steering Committee Members

Name	Affiliation
Monroe Raber	Landowner
Neil Ledet	IN Dept. of Natural Resources
Joe Draper	The Nature Conservancy
Beth Warner	The Nature Conservancy
Elizabeth Mizell	The Nature Conservancy
Kayleen Hart	Steuben County SWCD
Brian Musser	Steuben County SWCD
Steve Weideman	Shipshewana Lake Association
Rex Pranger	LaGrange County Surveyor
Karen Mackowiak	St. Joseph River Basin Commission
Steve Roth	Pigeon River Fish and Wildlife Area
Tom Atwater	Landowner
Lynn Bowen	LaGrange County Lakes Council
Boyd Jones	Shipshewana Sewage Treatment Manager
Sheryl Kelly	Town of Shipshewana
Derek Thompson	Natural Resource Conservation Service
Martin Franke	LaGrange County SWCD
Dona Hunter	LaGrange County SWCD

Stakeholder concerns regarding water quality and land use are listed in Table 2 as well as the relevance of the concerns to this project.

Table 2: Stakeholder Concerns

Concerns	Relevance	Potential Problem
Livestock access to open water	It has been noted that livestock often have regular access to open water for drinking water or to move between adjacent pastures	<i>E. coli</i> contamination, excess nutrients, streambank erosion and sediment
Stormwater runoff from barnyards	Stormwater will pick up pollutants from barnyards and carry them to open water if it is not properly contained or diverted from ditches, streams, rivers, and ponds	<i>E. coli</i> contamination, excess nutrients, and sediment
Increase in impervious surfaces	As the urban areas in the watershed expand, especially in Shipshewana, so does the impervious surfaces that increase stormwater runoff which will potentially carry pollutants to open water	Oil and grease, sediment, nutrients, increase in combined sewer overflows
Fertilizer used on urban lawns	As the urban centers in watershed expand so do the number of homes. Many homeowners are unaware of how to follow guidelines for lawn fertilizers and may over-apply fertilizer which has the potential to run over the land and into waterways	Excess nutrients and impaired biotic communities
Lakes in the area becoming more developed	Over fertilization of lawns around lakes in the area has been noted in the past. As more homes are built around the lakes more fertilizer has the potential to runoff the land and directly into the lakes	Excess sediment, nutrients and impaired biotic communities, <i>E. coli</i>
Septic system discharge	Septic systems, if not properly maintained, can leak effluent into ground water or leach into surface waters. There have been many advances in the area to improve sewage treatment however, this problem is out of the jurisdiction of the SWCD and will be handled by the local Health Departments.	Excess nutrients, <i>E. coli</i>
Horse manure on public roads	Due to a large Amish population in the watershed there is a concern about manure from horses on the public roads which has the potential to runoff the road during rain events and enter open water. This is a concern that will be discussed in the WMP but it is beyond the scope of this project to implement any measures to address the concern	<i>E. coli</i> contamination, excess nutrients

2.0 Physical Description of the Watershed Project Area

2.1 Watershed Location

The Pigeon River watershed project area is located within LaGrange and Steuben counties, as well as small portions of Elkhart, Noble, and DeKalb counties in Indiana, and St. Joseph County in Michigan. The Pigeon River and Pigeon Creek watersheds are subwatersheds of the greater St. Joseph River watershed (HUC 04050001).

As can be seen in Figure 2, the project area extends from the northwest and northeast corners of DeKalb and Noble counties, respectively, northwesterly through LaGrange County, the most northeast corner of Elkhart County to the southwestern portion of St. Joseph County. Land uses within the watershed consist of forest land, grassland, agriculture (row crops and animal operations), and small areas of residential, commercial and industrial land uses. The major residential areas within the project area include LaGrange, the LaGrange county seat, Mongo, Shipshewana, and Howe, Indiana and White Pigeon, Michigan. With 155,543 acres (243 square miles) the Pigeon River watershed comprises nearly 60% of LaGrange County and almost 92% of the Pigeon River watershed is located within LaGrange County.

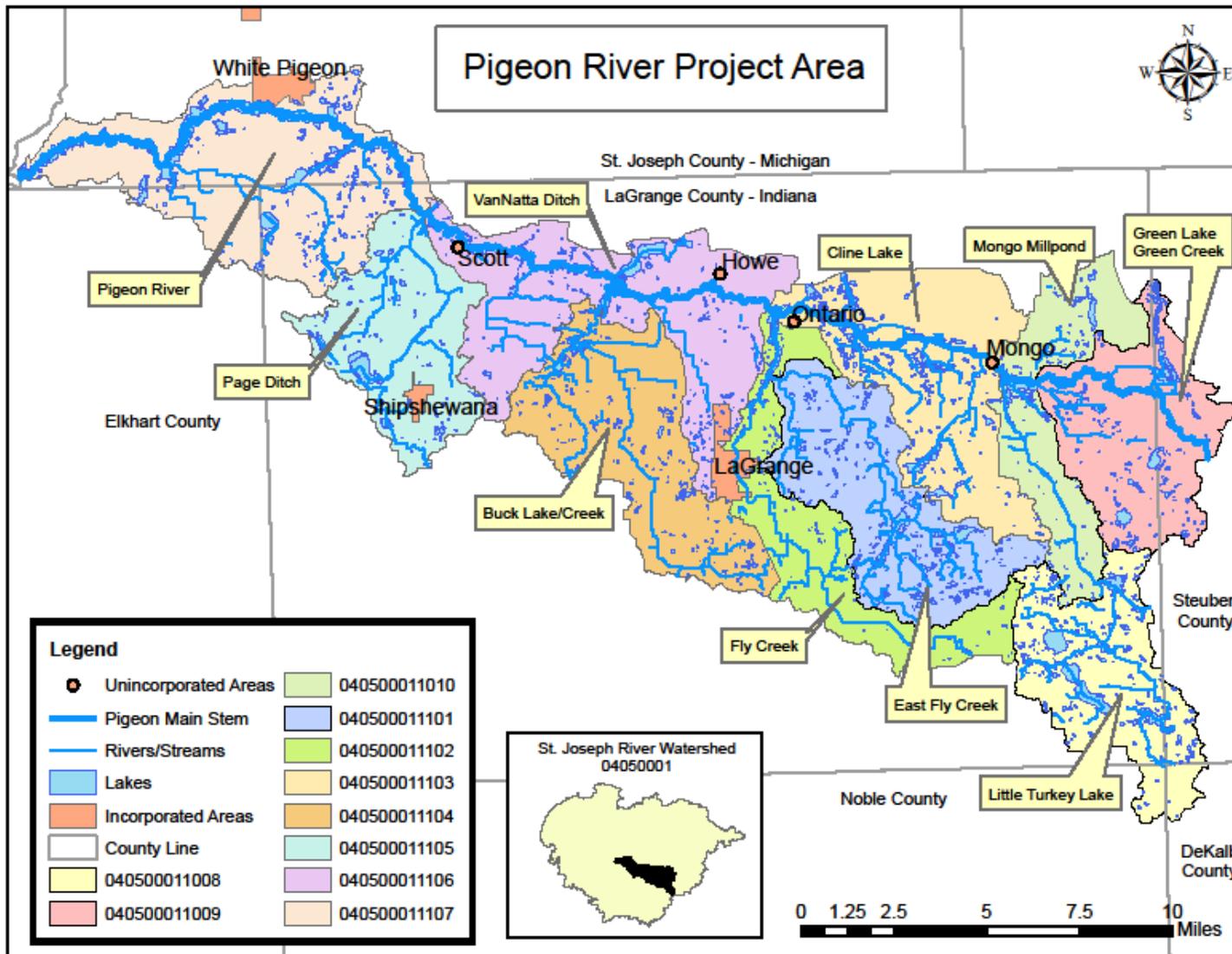


Figure 2: Pigeon River WMP Project Area

2.2 Subwatersheds

The Pigeon River and Pigeon Creek watersheds are subwatersheds of the greater St. Joseph River watershed (HUC 04050001). The project area, as can be seen in Figure 1, consists of ten, 12 digit HUCs; Green Lake-Green Creek (HUC 040500011009), Little Turkey Lake (HUC 040500011008), Buck Lake-Buck Creek (HUC 040500011104), Page Ditch (HUC 040500011105), Fly Creek (HUC 040500011102), VanNatta Ditch (HUC 040500011106), East Fly Creek (HUC 040500011101), Cline Lake (HUC 040500011103), Mongo Millpond (HUC 040500011010), and Pigeon River (HUC 040500011107). Each subwatershed will be discussed in further detail in Section 3 of this WMP.

2.3 Geology, Topography, and Soils

The landscape of northern Indiana and southern Michigan is directly influenced by the last great glaciation which occurred over 10,000 years ago; the Lake Michigan Lobe of the Wisconsinan glaciation. Prior to the glaciers sweeping over the land, the project area's landscape was comprised of rolling hills separated by broad valleys (Wilson, 2008). All of Indiana looked much like what southern Indiana currently looks like as the limits of the Wisconsinan glaciation follows the line connecting Terre Haute, Edinburgh, and Richmond, Indiana (Figure 3). As the glaciers advanced and retreated, the massive structures flattened the land surface and wiped out whole forests. As the glaciers melted they formed the many kettle lakes that give northern Indiana the nickname of "Lake Country". The melting glaciers also deposited rock, dirt and sand that they had picked up while traveling across the landscape. In the project area of northern Indiana and southern Michigan, where the glaciers melted relatively rapidly, glacial till ridges, called moraines, were left. However, the landscape is still much more level than pre-Wisconsinan times but presents a low rolling landscape.

The bedrock of the project area was deposited during the Mississippian Age, some 300 million years ago. The rocks deposited during the Mississippian Age are called the Borden Group and consist of siltstone, shale, sandstone, and a limited amount of limestone (Indiana Geological Survey, 1998). The type of bedrock present within the project area accounts for the ground water wells that supply drinking water to the Village of White Pigeon, MI, the towns of LaGrange and Shipshewana, IN and the many wells that supply drinking water to the rural communities throughout the project area. The surficial geology overlaying the bedrock ranges in thickness from 350 to 500 feet thick in the southeast portion of the project area, to 150 – 250 feet thick in the northwest portion of the project area. The unconsolidated deposits, above the bedrock, are between 351 and 500 feet thick in the southeast portion of the project area and between 151 and 250 feet thick in the north and northwest portion of the project area. The project area is covered in glaciofluvial material over the deeper clay deposits. The glaciofluvial material consists of mostly sand and gravel or loamy till.

The project area is located within several physiographic regions of Indiana and Michigan; the St Joseph Drainageway in the north, the Plymouth Morainial Complex and Warsaw Moraine in the central portion of the project area, and the Auburn Morainial Complex in the most southern edge of the project area (Figure 3). The topography of the project area is not drastically

different from one end of the watershed to the other. However, in Steuben County, where the project area begins, the land elevation is between 820 and 900 feet above sea level and in Elkhart County, where the watershed ends the land elevation varies between 760 and 810 feet above sea level. It is important to note however, that there are several small knobs with higher elevations from deposits left by the glaciers scattered throughout the watershed which gives the landscape of the project area small, beautiful rolling hills.

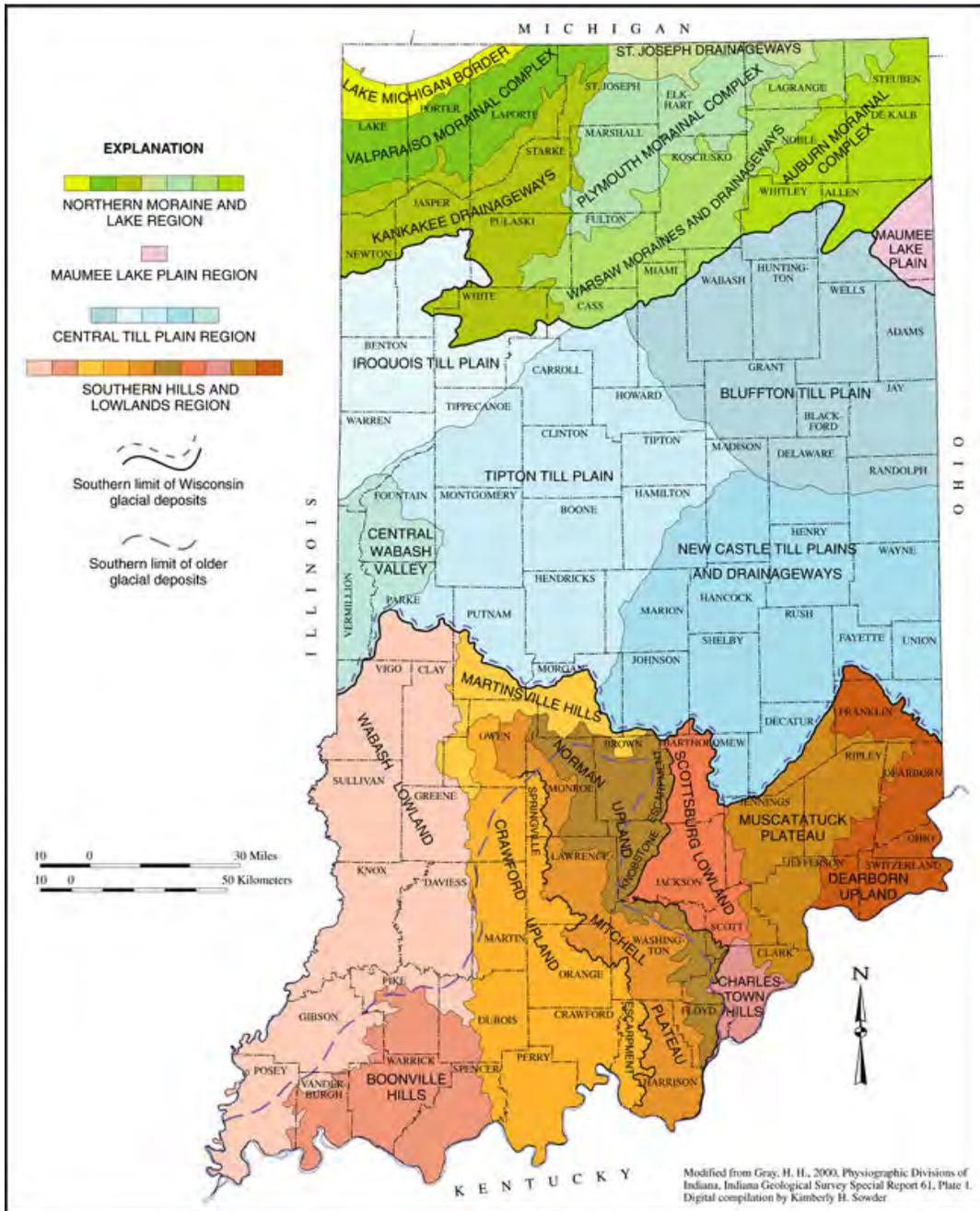


Figure 3: Indiana Physiographic Regions and Glaciation

The project area is comprised of four main soil associations, and six additional associations that make up less than 2% of the entire watershed. Table 3 is a list of the soil associations present in the project area and a description of each association. Soil association descriptions were acquired from the St. Joseph, Elkhart, DeKalb, Steuben and LaGrange county USDA soil surveys.

Table 3: Soil Associations

Soil Association	Association Description
Boyer - Oshtemo	Nearly level to moderately steep, well drained, coarse textured soils on outwash plains, valley terrains, moraines, and kames
Sebewa - Gilford - Homer	Nearly level, very poorly drained and somewhat poorly drained, medium textured and moderately coarse textured soils on outwash plains or valley terrains
Plainfield - Gilford	Nearly level to moderately sloping, excessively drained and very poorly drained, coarse textured and moderately coarse textured soils on outwash plains, knolls, and eolian dunes
Wawasee - Hillsdale - Conover	Nearly level to strongly sloping, well drained and somewhat poorly drained, moderately coarse textured and medium textured soils on till plains and moraines
Soil Associations totaling <2%	Association Description
Rawson - Morely	Gently sloping to strongly sloping, well drained and moderately well drained, medium textured and moderately coarse textured soils on till plains and moraines
Plainfield - Chelsea - Granby Variant	Deep, nearly level to moderately sloping, excessively drained and very poorly drained, sandy soils on outwash plains and bottom land
Kosciusko - Ormas - Boyer	Nearly level to strongly sloping, well drained, loamy and sandy soils that are moderately deep or deep over sand and gravel; on outwash plains and moraines
Riddles - Miami - Brookston	Deep, nearly level to moderately steep, well drained and very poorly drained, loamy soils on till plains
Glynwood - Pewamo - Morley	Deep, moderately well drained, very poorly drained, and well drained, nearly level to steep, loamy, clayey, and silty soils; on till plains and moraines
Blount - Pewamo - Glynwood	Deep, moderately well drained to very poorly drained, nearly level and gently sloping, silty, clayey, and loamy soils; on till plains and moraines

The NRCS maintains a database of highly erodible land (HEL), potentially highly erodible land (PHEL), and hydric soils for each county. The soils that have been determined to be highly erodible are so designated by dividing their average rate of erosion by the soil loss tolerance, which is the maximum amount of soil loss that can occur before a long term reduction in productivity will be seen. Soils are determined potentially highly erodible based on the percent slope and length of the slope. Hydric soils are designated as such due to their capacity to hold water. The list of HEL and PHEL provided by the LaGrange County, NRCS has several soils in

LaGrange County listed as either highly or potentially highly erodible. The LaGrange County soil survey posted on the NRCS Field Office Technical Guide, online, also listed those soils that are designated as hydric in LaGrange County. It is important to note that each county classifies the soils present within their jurisdiction differently, while the NRCS is in the process of standardizing classifications throughout the country, each county within the project area currently classify their soils differently which accounts for the abrupt change in soil classification that can be seen in the following HEL and PHEL, and hydric soil maps of the project area.

Constituting approximately 50% of the surface area, there are several soils that are classified as either HEL or PHEL located within the project area as can be seen below in Figure 4. Producers that are farming on HEL and PHEL can implement best management practices to limit the amount of soil runoff and the formation of rills or gullies so as to not lower the productivity of their farmland and to reduce the impact of sediment runoff into surface waters. It is suggested that any producer working HEL or PHEL follow a conservation plan to protect their vulnerable cropland.

Approximately 15% of soils present within the project area are classified as being hydric (Figure 5) which can pose threats to surface water when farmed due to excessive runoff of fertilizers, pesticides, and manure. Farmland located on hydric soils often requires the installation of field tiles to keep the fields from flooding or ponding. Field tiles can provide a direct conduit for water polluted with fertilizer, land applied manure, and sediment to reach surface waters. Hydric soils are also not suitable soils for septic usage as they do not allow for proper filtration of the septic leachate and may result in surface and/or groundwater contamination. Soils that are considered hydric are so classified for several reasons. The following explanation of hydric soils was taken from the NRCS, Field Office Technical Guide.

1. All Histels except for Folistels, and Histosols except for Folists.
2. Soils in Aquic suborders, great groups, or subgroups, Albolls suborder, Historthels great group, Histoturbels great group, Pachic subgroups, or Cumulic subgroups that:
 - A. are somewhat poorly drained and have a water table at the surface (0.0 feet) during the growing season, or
 - B. are poorly drained or very poorly drained and have either:
 - 1.) water table at the surface (0.0 feet) during the growing season if textures are coarse sand, sand, or fine sand in all layers within a depth of 20 inches, or
 - 2.) water table at a depth of 0.5 foot or less during the growing season if permeability is equal to or greater than 6.0 in/hr in all layers within a depth of 20 inches, or
 - 3.) water table at a depth of 1.0 foot or less during the growing season if permeability is less than 6.0 in/hr in any layer within a depth of 20 inches.
3. Soils that are frequently ponded for long/very long duration at the growing season.
4. Soils that are frequently flooded for long/very long duration at the growing season.

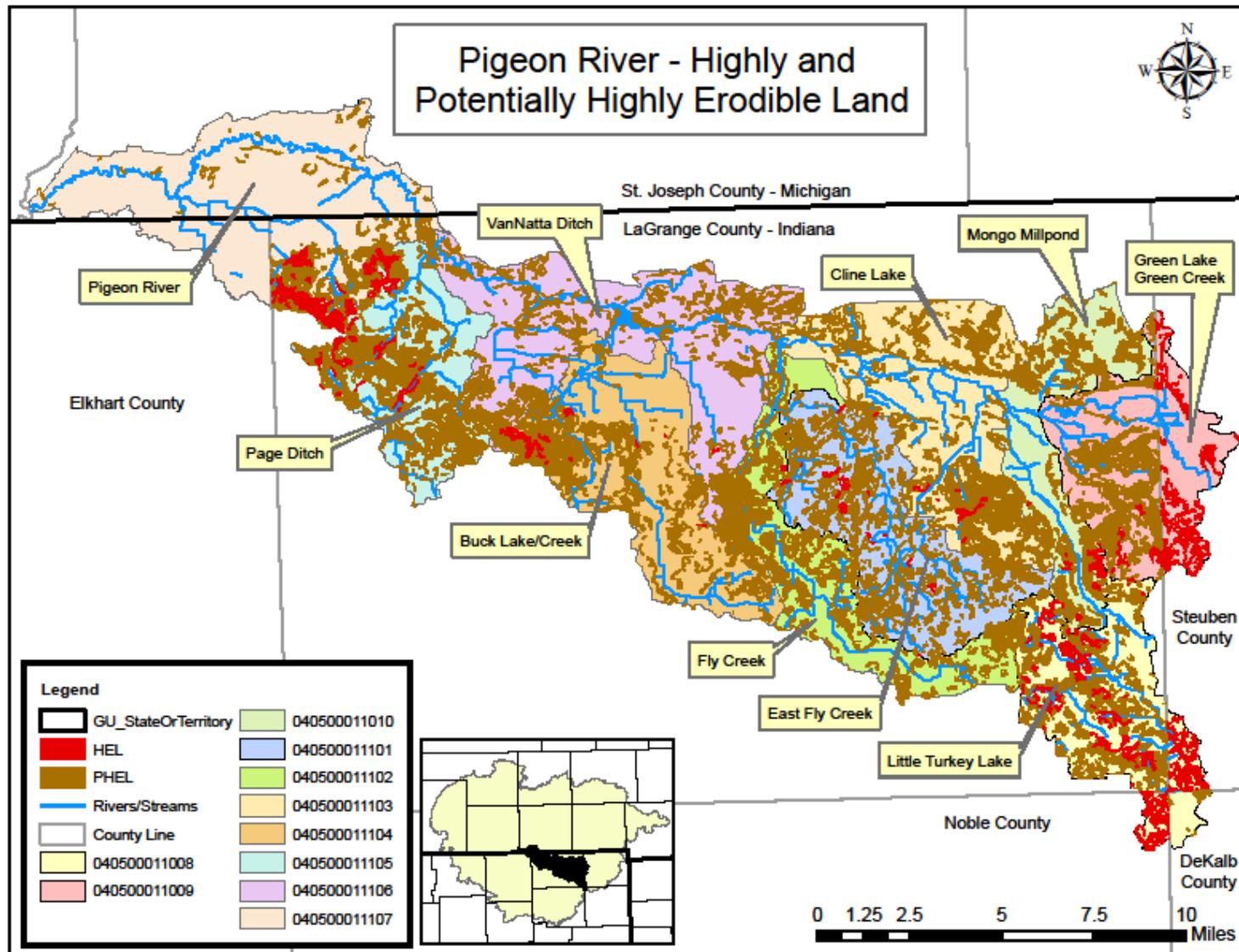


Figure 4: Highly and Potentially Highly Erodible Land

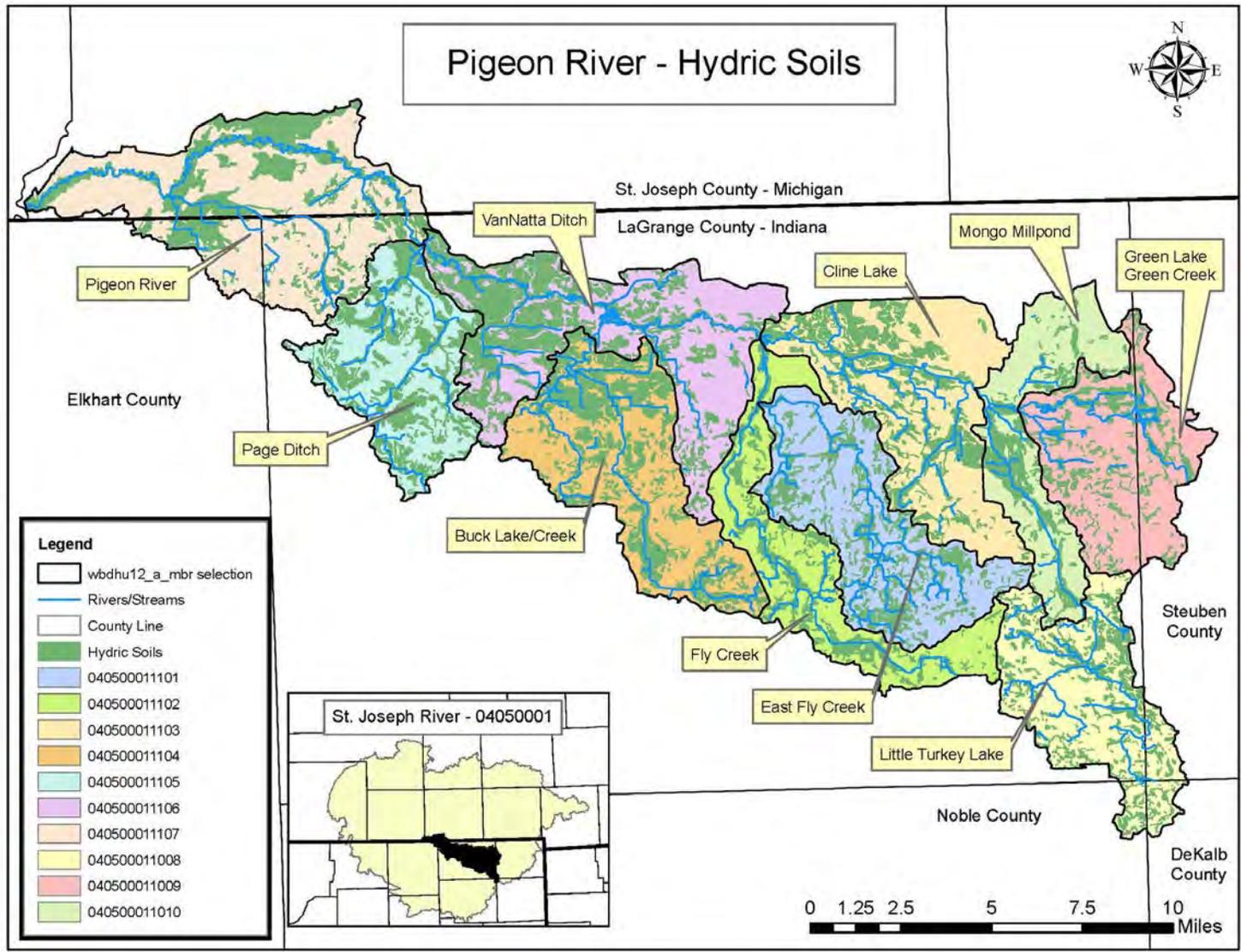


Figure 5: Hydric Soils in Pigeon River Watershed

Soil type is important to consider when installing a septic tank as traditional septic tanks utilize the soil to absorb effluent discharged from the tank into absorption fields. Septic tank absorption fields are subsurface systems of french drains that distribute septic liquid waste evenly throughout the designated area and into the natural soil. Soil properties and landscape features that affect the ability of the soil to properly absorb and filter the effluent should be considered when designing a septic system. Most of the rural population within the Pigeon River project area uses septic systems to handle their wastewater. However, nearly all soils (85% of surface area) located within the project area are rated as “very limited” for septic usage according to the NRCS, except for four soil types, which are rated as “somewhat limited”. Somewhat limited means that modifications can be made to either the site of septic installation or to the system itself to overcome any potential problems. A designation of “Very limited” means that modifications to the septic system site, or septic system itself, are either impractical or impossible. This will be discussed further in Section 2.6.2.

2.4 Climate

The project area has a temperate climate with warm summers and cool winters. According to the LaGrange County Economic and Development Corporation the average temperature in July is 72°F and 21°F in January. Due to the project area being located close to Lake Michigan, it experiences “lake effect snow” and receives higher amounts of snow fall than the rest of Indiana. Average snowfall in the project area is approximately 47 inches annually. Average rainfall in the project area is approximately 66 inches annually (LCEDC, 2010). Figure 6 graphically illustrates the temperature average per month and the annual precipitation in project area.

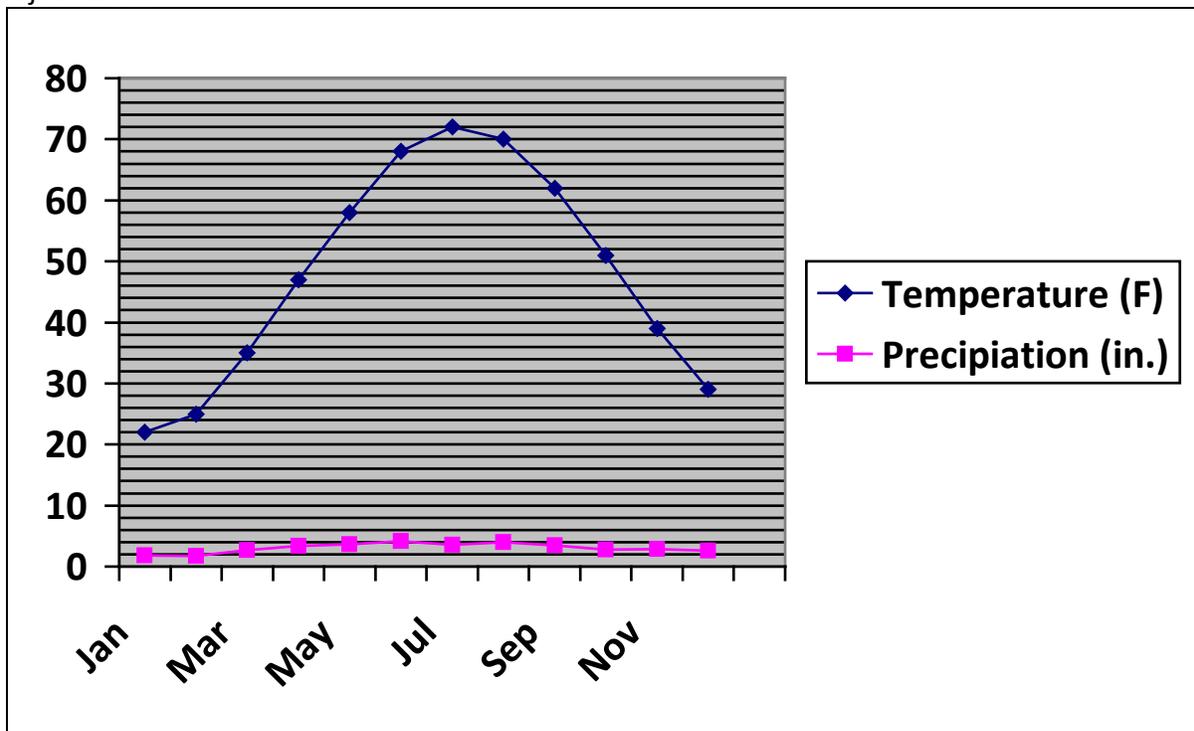


Figure 6: Pigeon River Watershed Climate

2.5 Hydrology

The Pigeon River watershed is comprised of many water resources including over 300 miles of streams, ditches, and canals, 2458 acres of lakes, 611 acres of ponds, and 19,894 acres of designated wetlands. There are 870 lakes, ponds, and reservoirs ranging in size from .25 acres up to 370 acres located within the project area. There are also over 479 miles of legal drain within LaGrange County and the portion of the watershed in the adjacent counties. Legal drains are waterways that are maintained by the local government for a designated use such as agricultural drainage ditches. Tables 4 through 6 show the number of stream miles and legal drains, and acres of wetlands, lakes, and ponds that are located within the Pigeon River project area.

Table 4: Stream Miles within the Project Area

Artificial Path (mi)	Canal/Ditch (mi)	Connector Ditch (mi)	Stream/River (mi)
90.74	55.76	0.13	160.85
Total			307.48 Miles

Table 5: Legal Drain Miles within the Project Area

County	DeKalb	Elkhart	LaGrange (Entire County)	Noble	St. Joseph	Steuben
	22.9	2.31	442.51	6.4	1.44	3.965
Total					479.525	Miles

Table 6: Wetlands, Lakes, and Ponds within the Project Area

Freshwater Emergent Wetland (acres)	Freshwater Forested/Shrub Wetland (acres)	Freshwater Pond (acres)	Lake (acres)	Riverine (acres)	Other (acres)
6691.35	12823.55	611.91	2458.033	379.3791	0.01
Total				22964.32	Acres

The most notable waterway located within the Pigeon River watershed is the Pigeon River itself. The Pigeon River is listed by Indiana as an “outstanding river” from S.R. 137 to the Indiana-Michigan border. An outstanding river is one that is of particular aesthetic or environmental value. The Pigeon River has over 40 miles of floatable length and flows through the Pigeon River Fish and Wildlife Area. For this reason, the Pigeon River is used frequently by outdoor recreation enthusiasts.

There are three dams located along the Pigeon River; at Mongo, forming the Mongo Millpond, at Ontario and at Nasby. The Mongo dam is regulated by the IN DNR to keep the millpond depth at a certain level to be used for hydroelectric power and it is approximately 77 acres in size. The Ontario pond is approximately 100 acres in size and the Nasby pond is nearly 40 acres in size. Both the Ontario and Nasby millponds are no longer used for hydroelectric power but are still both regulated by the IN DNR.

The IN DNR maintains a canoeing path along the Pigeon River from just east of Mongo up to the Michigan-Indiana border. There are three launching sites on the path; one at Mongo millpond, one just west of Howe, IN, and another west of Scott, IN near interstate 80/90. There are ten additional public access sites to the Pigeon River, which are not maintained by the state. The Pigeon River, as well as several surrounding lakes within the project area, is well regarded by anglers as there are several different types of fish that can be found within the watershed including largemouth bass, catfish, crappie, bluegill, and perch. As designated cold water streams, Pigeon River and Turkey Creek are both listed in the IN DNR 2011 trout stocking plan which has made this area of particular interest to anglers.

Northern Indiana is well known for three different attributes; 1) the many lakes in the area, 2) the abundance of hydric soils resulting in many wetlands, and 3) the prime agricultural land. These three resources located in northern Indiana can affect water quality and be affected by how the resources are used. For instance, the beautiful lake system in the project area has attracted not only the recreation enthusiasts mentioned above, but also many people who wish to live by or on the lakes' shores. There are thirteen residentially developed lakes located in the watershed in Indiana and two in Michigan. The following built-up lakes are located in the IN portion of the watershed starting east and moving west through the project area: Lake of the Woods, Big Long, Pretty, Big Turkey, Little Turkey, Royer, Fish, Pigeon, North Twin, South Twin, Shipshewana, Hunter, and Stone lakes. Marl and Fish lakes are located in MI. Total populations of each of these lakes cannot be accurately determined. The fact that these lakes are becoming more built-up is a concern of local stakeholders as this activity poses many threats to water resources such as sediment and excessive nutrients entering the lakes from overly manicured lawns and *E. coli* contamination from faulty or inadequately placed septic systems.

Nearly 90% of the project area use to be comprised of wooded areas and wetlands before the area was colonized. While many of these areas have been lost to agriculture or urbanized, there are still many wetlands that exist in the area; the most notable being located in the Pigeon River Fish and Wildlife Area (PRFWA) which is maintained by the IN DNR. The PRFWA has 356 acres of open water wetlands located on the property. Wetlands are vital to the sustainability of the ecosystem as they are essential for flood control and are natural pollution sinks as well as provide habitat for many flora and fauna including the endangered Massasauga Rattlesnake, Indiana Bat, and the Mitchell's Satyr Butterfly. Because of the many wetlands, which attract an abundance of fish and wildlife, located within the PRFWA, it is a popular destination for anglers, hunters and trappers as well as hikers and bird and wildlife watchers. Figure 7 shows where the wetlands within the project area have been delineated as determined by the USFWS National Wetland Inventory (NWI). The wetlands delineated in Figure 7 were not verified by a ground survey so should not be considered definite wetland boundaries but rather estimations only.

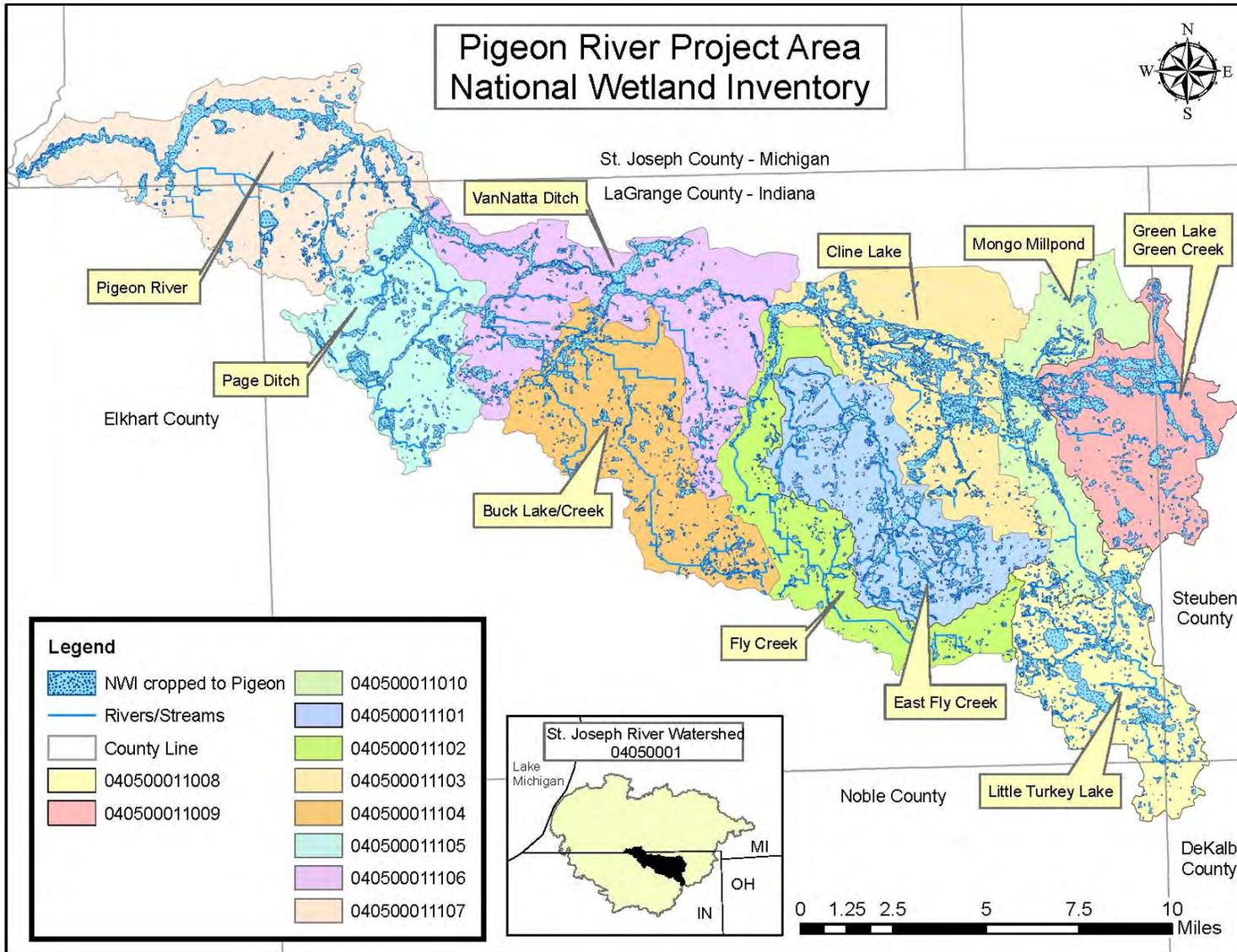


Figure 7: Wetlands Located within the Project Area

2.6 Land use

Land use in the project area greatly influences the quality of the water resources. Land in agricultural production has the potential to erode, especially if over-worked or if it is conventionally tilled annually. Thus soil particles carrying high levels of nutrients have the potential to reach open water sources and effect aquatic plants and animals and cause the water to become non-potable. Livestock rearing often can lead to high levels of bacteria in open water from manure storage areas that are not properly maintained or from livestock having direct access to open water sources. These two activities can also lead to high levels of sedimentation and nutrients in the water column. Industrial areas and urban centers can pose a threat to water quality due to the increased imperviousness of the landscape and industrial waste outfalls. For the reasons listed above, it is very important to investigate land use activities in the project area so as to determine the best method of remediating the pollution coming from the various land uses in the project area.

The Pigeon River project area land use is primarily agriculture, as can be seen in Figure 8 and Table 7. The land in the watershed that is utilized for the purpose of agriculture is either in row crops or it is utilized as pasture fields; typically for horses and/or cattle. There are few urban areas located in the project area including LaGrange, IN (P=2927), Shipshewana, IN (P=529), Howe, IN (P=550), Mongo, IN (P=300) and White Pigeon, MI (P=1544). There are also several small, unincorporated areas located within the project area including Ontario and Scott, IN. Table 7 below shows the number of acres of land in each type of land use per sub-watershed. Values were determined through the use of the Long Term Hydrologic Impact Analysis (L-THIA) program maintained by Purdue University's Engineering Department. It is important to note that Figure 8 depicts more land uses than was analyzed using the L-THIA program, however the analysis performed by L-THIA is a more accurate tool to determine percentages of land use with in the watershed project area.

Table 7: Distribution of Land Use in the Project Area

Land use	Unit	Green Lake/ Creek	Mongo Millpond	Little Turkey Lake	Cline Lake	East Fly Creek	Fly Creek	VanNatta Ditch	Buck Lake	Page Ditch	Pigeon River	Total	% of Project Area
Water	Acres	3766.3	2390.9	3248.8	4705.8	3378.6	1138.9	3234.9	1761.9	1948.8	671.7	26246.6	16.8
Developed (High Density)	Acres	240.9	185.4	313.4	303.5	353	774.3	1064.7	471.5	677.5	678.2	5062.4	3.3
Developed (Low Density)	Acres	494	288.6	517.9	722.7	909.8	845.7	1005.6	569.6	471.8	1372.13	7197.83	4.6
Industrial	Acres	28.7	N/A	4.4	0.9	17.9	53.8	94.4	5.5	108.8	N/A	314.4	0.2
Cultivated Crops	Acres	6382	6146.7	5874.5	8992.8	7805.7	5852	10485.8	7341.3	4116.8	11471	74468.6	47.9
Grass/Pasture	Acres	1688.5	859.9	2343.5	1158.7	3137.9	1796.2	3527	5618.1	4659.8	2639.7	27429.3	17.6
Forest	Acres	960.1	620.6	970.3	1412.4	1169.1	443	903.6	709.4	676.2	5600.7	13465.4	8.7
Other	Acres	1.5	0	10.2	6.2	0	2.1	0	4.7	3.3	1330.57	1358.57	0.9
Total	Acres	13562	10492	13283	17303	16772	10906	20316	16482	12663	23764	155543	100

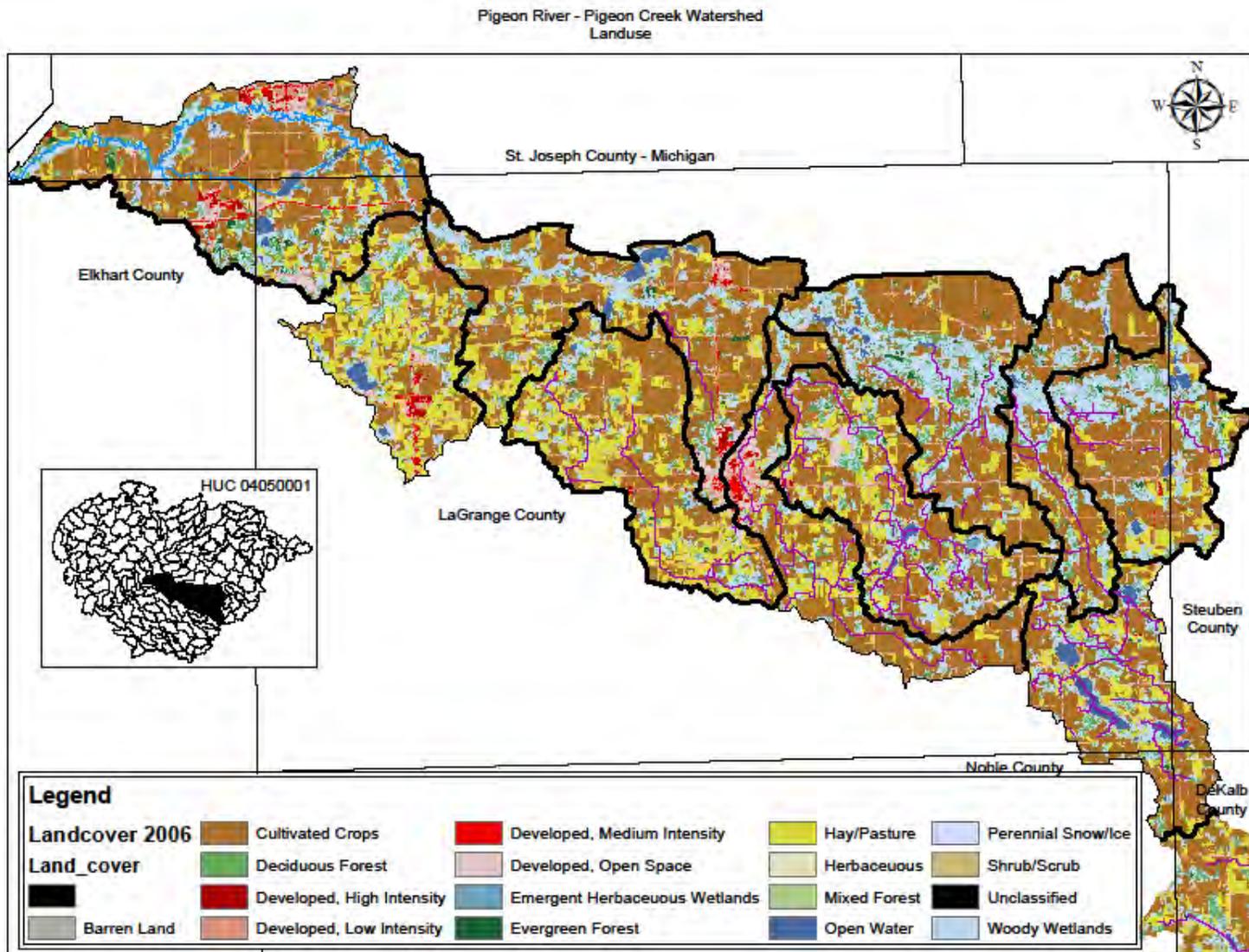


Figure 8: Pigeon River Watershed Project Area Land use

2.6.1 Tillage Transect

Tillage transect data was only requested for St. Joseph County, MI and Steuben and LaGrange County, IN as the portion of the watershed located in DeKalb, Elkhart, and Noble County is negligible. Transect data has not been collected in MI since 1993 and Jerry Grigar, the MI NRCS State Agronomist, believes there are a lot more beans and small grains in no-till now than when the data was last collected. Steuben County has been very successful in encouraging and implementing conservation tillage practices with over 90% of all fields being in some type of conservation tillage practice. LaGrange County has a significant number of fields in conservation tillage, but it has proven difficult to convince Amish producers in the county to switch from traditional conventional tillage practices. Table 8 shows the percent, or number, of fields in conservation tillage by county.

Table 8: Tillage Transect Data

County	Year Data Collected	No-Till	Mulch Till	Reduced Till	No-Till	Mulch Till	Reduced Till	Unit
		Corn			Beans			
St. Joseph	1993	20,000	N/A	N/A	14,000	N/A	N/A	Acres
Steuben	2010	37.9	32.2	23.2	93.9	3	2.4	Percent
LaGrange	2009	26	12	14	68	16	8	Percent

2.6.2 Septic Systems

There are several communities located within the project area utilizing on-site waste water treatment systems. However, it is important to note that the more populated towns and lakes are now on a centralized sewer system, or have plans to convert to a centralized sewer system in the near future. The communities on a central sewer system are the towns of LaGrange and Shipshewana, as well as Fish and Royer Lake which are serviced by the LaGrange County Regional Utility District F and Little and Big Turkey Lakes, Lake of the Woods, Pretty Lake and Big Long Lake which are serviced by the LaGrange County Regional Utility District B.

In 2005 the LaGrange County Health Department conducted a study to determine the number of faulty septic systems present within LaGrange County. Through that study, it was determined that nearly 75% of all septic systems within LaGrange County are failing. This is likely due to the fact that there are very few soils located within the project area that are considered by the United States Department of Agriculture to be suitable for septic system usage. As discussed in Section 2.3, USDA soil surveys rank soils as being suitable, somewhat limited, or very limited for septic system placement. Most soils located within the project area are ranked as either very limited or somewhat limited for septic system usage. This is due to the porous soils and a high water table. Faulty septic systems are a concern as septic system leachate may increase nutrient levels, as well as, fecal coliform, including the harmful *E. coli* bacteria, in both surface water and ground water, which is the predominant source of drinking water within the project area. Figure 9 graphically shows the location of soils in the watershed that are ranked somewhat or very limited for septic system placement.

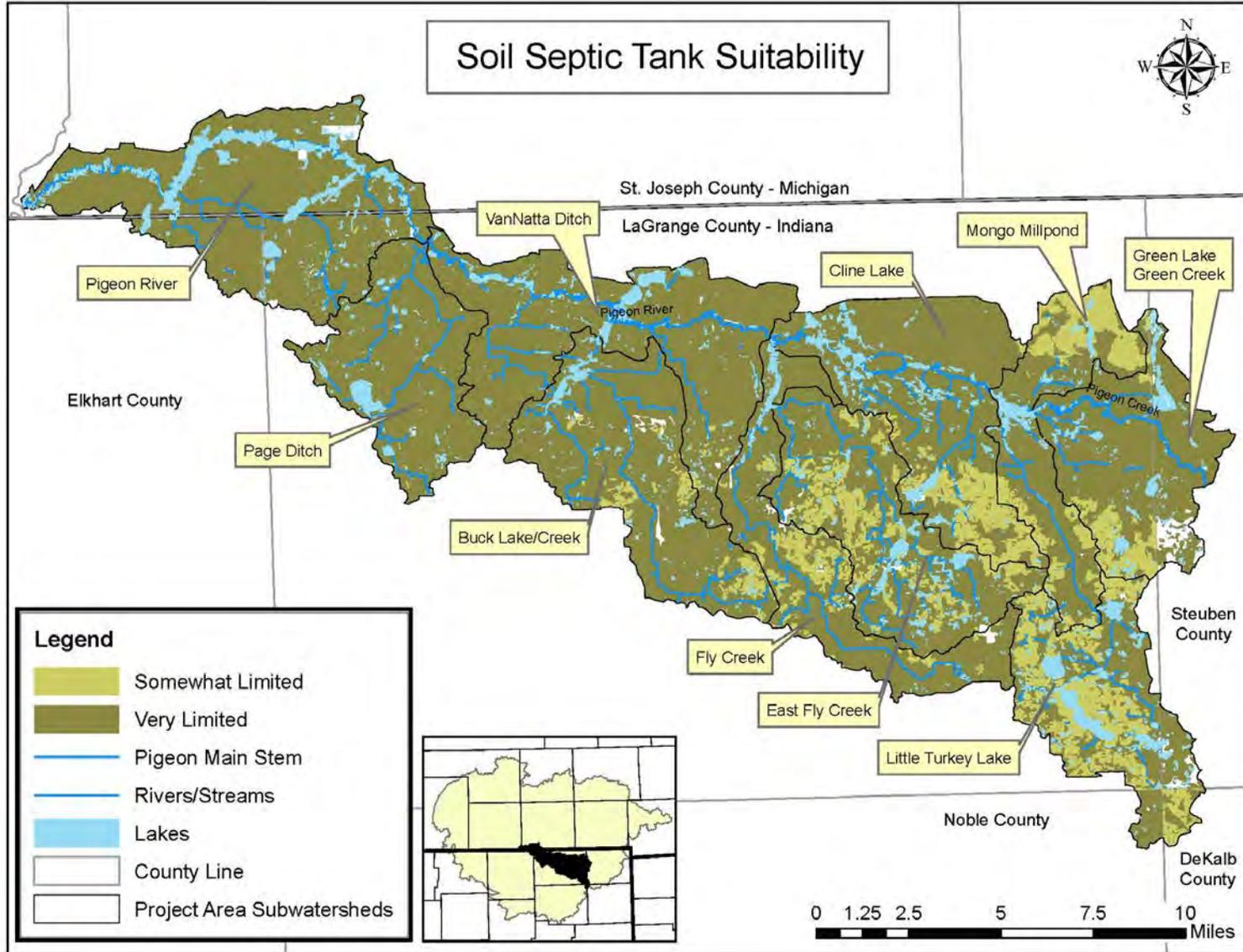


Figure 9: Project Area Soil Suitability for Septic System Placement

2.6.3 Animal Feeding Operations

With a large portion of the population in the project area being Amish, many of the rural homes have several horses on the property, including standard horses to be used as a means of transportation, and draft horses which are used as work horses, typically for plowing. The large number of horses in the watershed can pose a threat to water resources as they leave a significant amount of manure on public roads, and often have direct access to surface water for drinking water. This will be discussed in further detail in subsequent sections.

Also scattered throughout the project area are animal operations with animal counts below the threshold which would require the producer to acquire a permit. It has been noted that several poultry houses are going up throughout LaGrange County. There are also several livestock operations, mostly dairy, scattered throughout the project area. The unregulated animal feeding operations can pose a threat to surface water if the manure is not properly stored or utilized, the barnyard does not have runoff control, and if the livestock have direct access to an open ditch.

There are 15 registered Confined Feeding Operations (CFOs) located in the project area, with two of those CFOs being Concentrated Animal Feeding Operations (CAFOs). A confined feeding operation is so designated if there are 300 cattle, 500 horses, 600 swine or sheep, or 30,000 fowl present on the property and confined for at least 45 days during the year where there is no ground cover or vegetation present over at least half of the animals' confinement area. If the size of the operation is very large, or there have been compliance issues with an operation in the past, the CFO may be designated as a Concentrated Animal Feeding Operation (CAFO), and will be required to obtain a National Pollution Discharge Elimination System (NPDES) permit. A map of CFOs/CAFOs located in the project area can be seen in Figure 10.

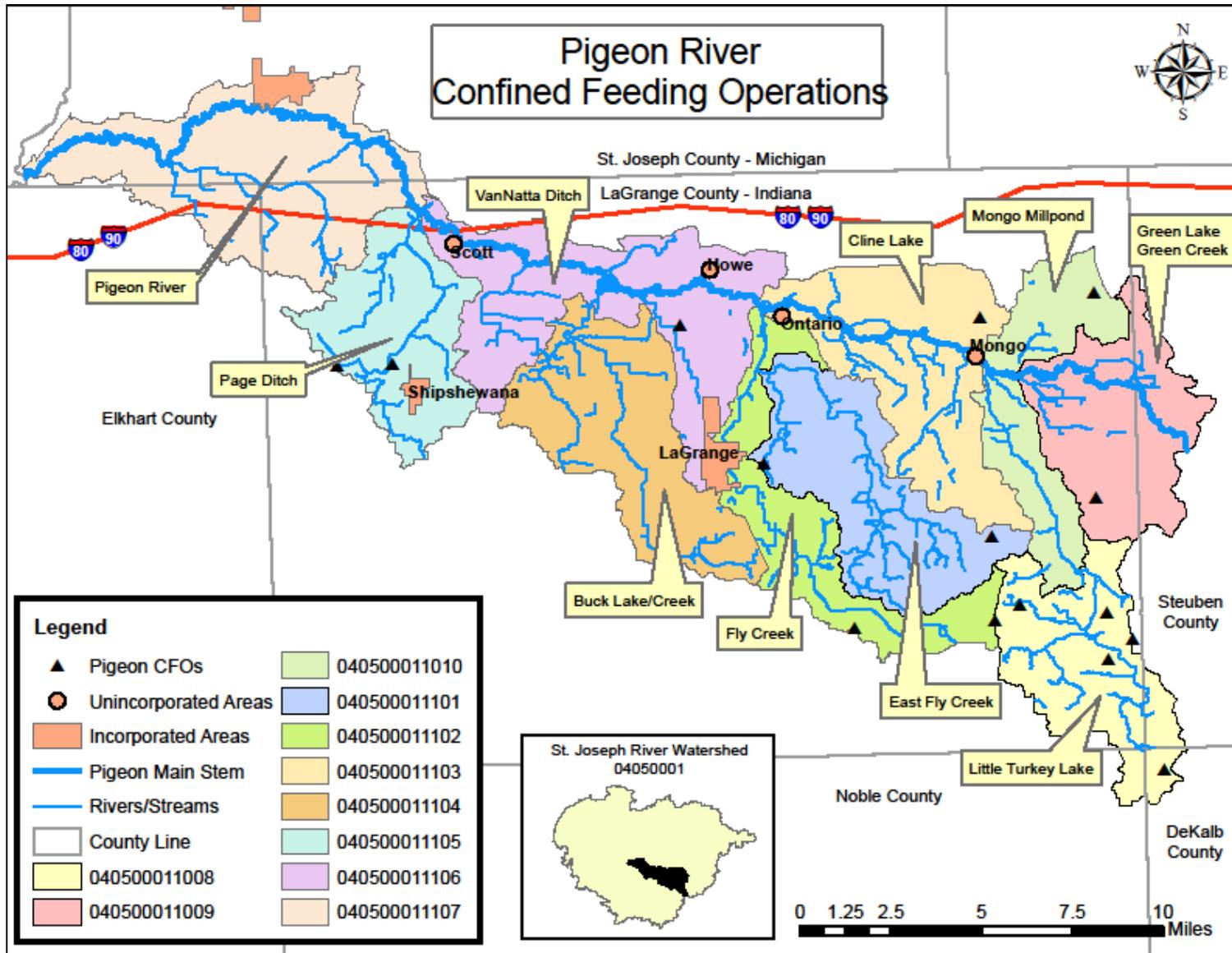


Figure 10: Pigeon River Project Area CFOs

2.6.4 Population Centers

Few medium and low density urban areas are located within the project area including the incorporated city of LaGrange (P = 2927) and Town of Shipshewana (P = 529), as well as the unincorporated Village of Howe (P = 550), Village of Mongo (P = 300), Scott and Ontario, Indiana (population not documented) and over half of the incorporated area of the Village of White Pigeon, MI (P = 1544) (Figure 11). While most urban areas have a stagnant growth rate, the Town of Shipshewana has been growing rapidly due to it being a prime tourist attraction in the region. Of the 870 lakes, ponds, and reservoirs located in the project area; fifteen of the lakes are built-up. When people make their home around a lake much of the natural land around the lake is removed to make room for houses, boat launches, septic systems, and turf grass. This often leads to increased imperviousness and nutrient content of the lake, and decreased prime wildlife habitat.

2.6.5 Community Parks

Several parks, encompassing approximately 12,178 acres of land, are located within the project area. The parks are managed by the state, county, town, or a non-profit entity. The parks are used by local stakeholders for recreational purposes. A list of the parks located within the project area is provided in Table 9.

Table 9: Parks Located Within Pigeon River Watershed

Name	County	Acreage	Managed by:
Cline Lake Fen	LaGrange	124	The Nature Conservancy
Maple Wood Nature Preserve	LaGrange	29.6	Acres Land Trust
Maple Wood Park	LaGrange	131	LaGrange Parks Dept
Pigeon River Fish and Wildlife Area	LaGrange	11,605	IN DNR
Pine Knob Park	LaGrange	59	LaGrange Parks Dept
Scott Mill Park	LaGrange	120	LaGrange Parks Dept
Shipshewana Lake Beach	LaGrange	2	LaGrange Parks Dept
Shipshewana Town Park	LaGrange	23	Shipshewana Park Dept
Stark Nature Preserve	LaGrange	41.2	Acres Land Trust
Turkey Creek Wetland Conservation Area	LaGrange	8	IN DNR
Wahbememe Historical Monument	St. Joseph	N/A	St. Joseph Parks Dept
Yost Pond Nature Preserve	LaGrange	35	IN DNR

2.6.6 Potential Contamination Sites

There are several remediation sites and potential contamination sites located in the project area including underground storage tanks (USTs), leaking underground storage tanks (LUSTs), facilities required to hold a National Pollution Discharge Elimination System (NPDES) permit, and industrial waste sites (Figure 11). These sites must be monitored carefully to be sure that no contamination of surface or ground water occurs. There are no brownfield or superfund sites located within the project area.

USTs are managed by the IDEM Office of Land Quality's Underground Storage Tank program and the MI DEQ Underground Storage Tank program. The states are charged with assuring all underground storage tanks meet both state and federal regulations to mitigate the risk of contamination to surrounding land and/or water resources. The states are also responsible for making sure those tanks that do not meet requirements are properly closed or up graded. There are 54 USTs located in the project area, of those, 31 are considered to be LUSTs. LUSTs will be discussed in Section 3 under each respective subwatershed.

Facilities that discharge directly into a waterbody are required to obtain an NPDES permit from the overseeing state agency (IDEM and MI DEQ). The permit regulates the amount of contaminants a facility can discharge into surface water and requires the facility to conduct regular water quality monitoring. While these facilities are regulated by the State, there is the potential that they may have accidental leaks, or in some cases, the facilities may release a substance that they are not required to report to the State which may pose a threat to water quality; phosphorus is a common parameter not required to be reported. There are several NPDES permitted facilities located in the project area. NPDES facilities and their discharge points will be mapped in their respective subwatershed in Section 3 of this WMP.

There are several facilities located on the EPA's toxic release inventory (TRI) as industrial waste sites located throughout the project area. However, most facilities are located near population centers or near interstate 80/90. The TRI is a database containing the names of facilities that dispose of or release toxic chemicals into the environment. There are over 600 toxic chemicals that are included in the TRI.

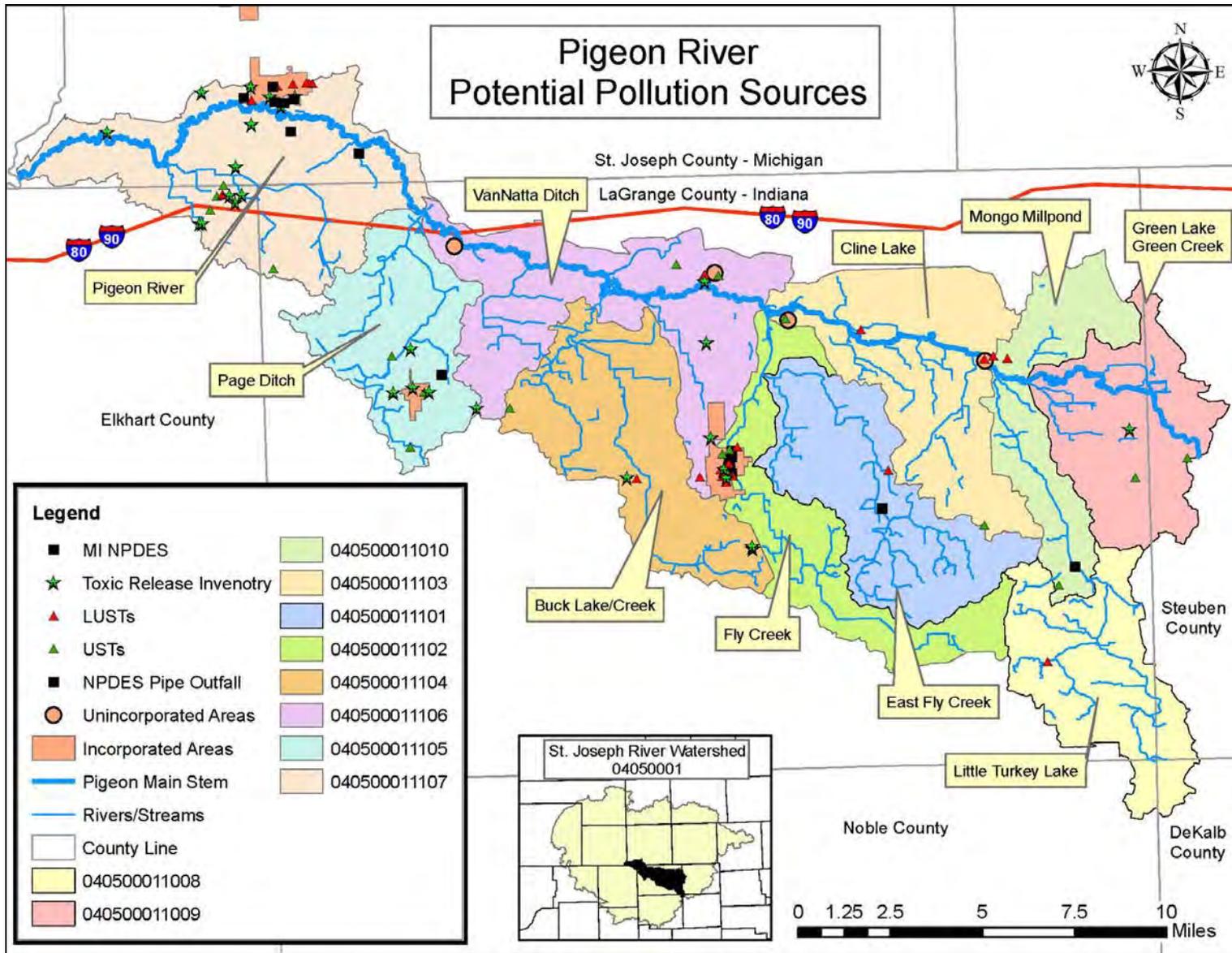


Figure 11: Potential Pollution Sites

2.7 Current and Historic Watershed Planning Efforts

The project area provides many scenic areas which many of the stakeholders in the watershed feel should be preserved as well as an abundant amount of recreational opportunities for the individuals who live within the project area and tourists from around the region. For these reasons, several studies regarding water quality, land use, and wildlife habitat have been conducted and many resource management plans have been developed within the Pigeon River watershed.

The Steuben County SWCD developed a WMP for the Pigeon Creek watershed located entirely within Steuben County. While the WMP does not cover any portion of the Pigeon Creek or Pigeon River located within this project area, it does provide information regarding problems found in the Pigeon Creek, which drains into the Pigeon River watershed, and proposes solutions to those problems.

Several concerns that were identified during the creation of the Pigeon Creek WMP mirror the concerns of the stakeholders within the Pigeon River watershed and are outlined in Table 10. The proposed solutions to stakeholder concerns and water quality problems identified in the Pigeon Creek WMP, once implemented, will have a positive impact on the project area's water quality by decreasing the amount of NPS entering the Pigeon River watershed.

Table 10: Stakeholder Concerns in the Pigeon River and Pigeon Creek Watersheds

Concerns	Pigeon River Watershed	Pigeon Creek Watershed (Steuben)	Proposed Solutions from Pigeon Creek WMP
Livestock access to open water	√	√	Fence animals out of open water
Stormwater runoff from barnyards	√	√	Manure management, filter strips
Increase in impervious surfaces	√	√	limit new construction, on-site stormwater management
Fertilizer used on urban lawns	√		
Lakes in the area becoming more built-up	√		
Septic system discharge	√	√	Inspections, dye testing, hook-up to municipal sewer systems, education/outreach
Horse manure on public roads	√		

There have been several studies completed specifically in the Pigeon River watershed as well as Master and/or Comprehensive Plans for urban areas located within the project area. Table 11 is a list of the scientific or investigative studies that are relevant to the concerns of the project

stakeholders and have been completed within the project area to date, the date in which it was completed, by whom the study was conducted, and the relevance of the study to stakeholder concerns. Table 13 is a list of the Municipal Master/Comprehensive Plans that have been completed within the project area and Table 14 is a list of all wellhead protection plans that have been completed in the project area to date.

Table 11: Previous Studies in Pigeon River Watershed

Study/Plan	Topic	Year	Writer	Stakeholder's Relevant Concern
Big Turkey and Little Turkey Lake Enhancement Feasibility Study	Water Quality	1990	Harza Engineering Co	Lakes in the area becoming more built-up, fertilizer used on urban lawns
Big Long Lake, Lake of the Woods, McClish Lake, and Pretty Lake, A Study for their Improvement, Restoration, and Protection	Water Quality/ Fisheries	1991	EarthSource Inc.	Lakes in the area becoming more built-up, livestock access to open water, fertilizer used on urban lawns
Monitoring Study for the Turkey Creek Land Treatment Project	Water Quality - Land Treatment	2001	J.F. New Assoc. Inc.	Septic system discharge
Pretty Lake Diagnostic Study	Water Quality/Fisheries	2007	J.F. New Assoc. Inc.	Septic system discharge, Lakes in the area becoming more built-up, fertilizer used on urban lawns
Pretty Lake Engineering Feasibility Study	Land Treatment	2009	J.F. New Assoc. Inc.	Septic system discharge, Lakes in the area becoming more built-up, fertilizer used on urban lawns
Saint Joseph River Watershed Management Plan	Water Quality/Watershed Management	2005	Friends of the St. Joseph River Association	Septic system discharge, stormwater runoff from barnyards, fertilizer used on urban lawns

Big Turkey and Little Turkey Lake Enhancement Feasibility

The 1990, Harza study of Big and Little Turkey Lakes was conducted at the request of the lake residents and users as they noticed increased macrophyte beds, algae blooms, and sediment plumes following storm events. The Turkey lake stakeholders were concerned about the overall water quality of the lake system as the lakes became more built-up and unsustainable agricultural farming techniques lead to increased erosion and nutrient runoff. The main recommendation proposed in the study to remediate the problems seen in the lakes was to install wetlands within the lake watersheds to act as sediment traps which would not only lower the frequency of sediment plumes but would also keep nutrients attached to the soil particles from reaching the lakes thus lowering the frequency of macrophyte and algae beds. However, it was recognized that the installation of sediment traps is not a long term solution to the problem. Therefore, the study recommended that agricultural land within the watershed be enrolled in the Conservation Reserve Program (CRP), cover crops be installed, and nutrient management plans be implemented to stop the pollution at the source.

Big Long Lake, Lake of the Woods, McClish Lake, and Pretty Lake

As mentioned previously, the lakes in Northeast Indiana provide many resources to the region such as fishing, swimming, boating, and wildlife viewing and they provide a great economic benefit to the community. For this reason, the LaGrange County Health Department performed a preliminary study of 24 lakes within LaGrange County in 1988. The 1991 study conducted by EarthSource, Inc. was an expansion of that initial study. The findings made by EarthSource indicated that many of the lakes in LaGrange County are eutrophic as a result of increased urban expansion, unsustainable agricultural practices, and excess phosphorus entering open water from sediment runoff and agricultural and urban fertilizers. Recommendations provided by EarthSource to remediate the problems seen within the lake system include preservation of forests, riparian vegetation and wetlands, avoid stream modification, stabilize drainage areas after and during construction, restrict livestock access to open water, incorporate manure immediately after land application, use low phosphorus fertilizers, and use lake water as fertilizer to provide a source of nutrients.

Monitoring Study for the Turkey Creek Land Treatment Project

The Steuben County Soil and Water Conservation District received funding in 2001 from the INDNR, Lake and River Enhancement Program (LARE) to perform a water quality analysis in the Turkey Creek Watershed as stakeholders were concerned about the degradation of the creek. The findings of the study showed *E. coli* levels that exceeded the state standard, impaired fish and insect communities, and aquatic habitat, as well as a lack of pool-riffle-run characteristics in the creek which is necessary for a healthy biotic community. Several recommendations were provided in the study which would improve water quality within the watershed. The recommendations included implementing best management practices such as riparian corridor plantings, streambank stabilization, wetland restoration, and nutrient, pesticide and tillage management plans, among others and to begin an intensive stakeholder education program focusing on water quality and best management practices. It was also suggested in the study to continue monitoring water quality as BMPs are implemented to determine the effects the projects are having on the quality of watershed. The Steuben county SWCD has continued to receive funding to implement the BMPs outlined in the study and has had great success doing so over the past decade. Table 12 shows the BMPs implemented through the Turkey Creek LARE grant.

Table 12: Turkey Creek Implementation

BMP	Amount	Unit
Filter Strip	53.4	Acre
Tree Plantings	136.2	Acre
Sediment Control Structures	9	Each
Animal Waste Facility	2	Each
Hay Plantings	716.4	Acre
Grass Waterway	8945	Feet
Critical Area Planting	1.1	Acre
Tree Spraying	79	Acre
Riparian Buffer Strip	1	Each
Exclusion Fence	3451	Feet
Water Facility	1	Each
Integrated Crop Management	1201.1	Acre
Cover Crop	69	Acre

Pretty Lake Diagnostic Study

Pretty Lake has historically been known as a lake with good water quality and great clarity which has drawn individuals to the lake for recreational activities as well as a home. The shoreline of the lake has been completely developed over the last several decades which led to an increase in NPS reaching the lake. Lake residents began to notice a decrease in water clarity, especially after heavy rain events, and together with the Pretty Lake Conservation Club, applied for funding through the LARE Program in 2006 to perform a diagnostic study of the lake's water quality and the surrounding land uses. Water quality and land use analysis in the Pretty Lake watershed suggest that while water quality appears to be good at the present, there is

potential for it to degrade due to the soil being unsuitable for septic systems, the presence of highly erodible land, and high levels of *E. coli* present in water samples.

Pretty Lake Engineering Feasibility Study

The 2009 Pretty Lake Engineering Feasibility Study, conducted as a follow-up to the 2006 diagnostic study, outlines several best management practices that should be implemented to protect Pretty Lake's water quality. These BMPs include grass swales, a rain garden, a stormwater catch basin, repairing a broken residential drainage tile, a two-stage ditch, and tree canopy reduction to promote the growth of vegetation along the streambank. All suggested practices have been given written approval by the landowner or appropriate entity in charge of the area, except for the rain garden. If these practices are implemented, the amount of sediment carrying other contaminants that reach Pretty Lake will be significantly decreased. While the main concern being addressed in the Pretty Lake studies was sedimentation, the suggested BMPs, if implemented, will also address the Pigeon River stakeholder concerns of increased fertilizer reaching open water after being over applied on urban lawns and the increase in stormwater runoff due to an increase in impervious surfaces. There have been no BMPs implemented on Pretty Lake as a result of this study to date.

St. Joseph River Watershed Management Plan

The Friends of the Saint Joe River Association, a 501(c)3 organization, completed a watershed management plan for the entire St. Joseph River watershed (HUC 04050001) in 2005. The watershed is 4,685 square miles and includes 15 counties in Michigan and Indiana. Because of the large size of the watershed, the WMP is vague in its description of the watershed and the water quality problems in the watershed. However, the plan noted the Pigeon River watershed as being critical for agricultural practices that degrade water quality. Using a SWAT model, it was determined that the most effective BMPs to limit NPS pollution from entering the Pigeon River are a combination of no-till, filter strips, and contour farming. The WMP also recognizes the LaGrange County SWCD for its efforts to reduce sediment, nutrient, and pathogen contamination of surface water by implementing a livestock management program.

Table 13: Previous Master/Comprehensive Plans in Pigeon River Watershed

Study/Plan	Topic	Year	Writer	Stakeholder's Relevant Concern
Shipshewana Master Plan	Town Planning	1993	Ball State University	Increase in impervious surfaces, lakes in the area becoming more built-up
St. Joseph County Master Plan	County Planning	1997 (updated 2007)	St. Joseph County Planning Commission	Livestock access to open water, septic system discharge
LaGrange County Comprehensive Plan	County Planning	2005	McBride Dale Clarion	Increase in impervious surfaces, lakes in the area becoming more built-up
LaGrange County Parks Department Master Plan	County Planning	2008	LaGrange County Parks Department	All concerns through education

Shipshewana Master Plan

The town of Shipshewana, IN, located in Page Ditch subwatershed, contracted Ball State University to write a Master Plan for the town in the late 1990s. Unfortunately, due to restructuring of the town government, the majority of the Plan has been lost. The portion of the Plan that is available includes plans to develop a nature trail along the old Pumpkinvine railroad corridor between the city of Elkhart and Shipshewana, improve the water quality of Shipshewana Lake, and hook the unsewered residences of Shipshewana Lake up to the Shipshewana waste water treatment plant. To date, the Pumpkinvine trail has begun development, providing more outdoor recreational opportunities for local residents and tourists, Shipshewana Lake has been dredged and water quality educational workshops and materials have been provided to the residents living on the lake, and Shipshewana began accepting bids on a waste water treatment system in November, 2010 for Shipshewana Lake residents. Work was slated to begin on the project in 2011, though no activity has taken place yet. While only a small portion of the original Master Plan is available for review, two of the major stakeholder concerns are addressed in the Plan; Lakes in the area becoming more built-up and septic system discharge. It should be noted however, that the town of Shipshewana is currently in the process of rewriting a complete Master Plan. A completion date for the new Master Plan has not been set.

St. Joseph County Master Plan

The St Joseph County Planning Commission, recognizing the fertile soil and abundance of ground water for irrigation, developed a County Master Plan in 1997 focusing on the protection of prime farmland within the county, while also taking into account the natural resources of the area. Several of the goals established during the development of the Master Plan are directly related to concerns expressed by the Pigeon River Project Steering Committee. Those goals are listed below.

- “Provide for the development of sanitary sewers, improved sanitary disposal systems...”
- “...encourage long-term commitments to environmentally sound agricultural activities...”
- “Encourage intensive livestock operations ...to locate away from areas prone to flooding.”
- “Do not over-plan or over-zone for commercial (or industrial) development.”
- “Establish a minimum setback for vegetative buffer along lakeshore or stream (and septic tanks and drainfields).”
- “Direct animal grazing landward of the vegetative buffer strip (along lakeshores and streams).”

The St. Joseph County Planning Commission has been updating their Master Plan regularly. The last update was completed in 2007 and it had a stronger focus on environmental conservation and preservation including such goals as maintaining a 1:1 ratio of “built-up” area and open and/or green space. The 2007 update also included a map of areas where increased sewer system capacity is necessary to maintain the integrity of the surrounding natural resources. Figure 12 is a map, taken from the 2007 Master Plan update, showing where the current wastewater treatment plants are and where new or expanded systems should be constructed to meet the projected population growth. The black oval drawn on the map represents the area of St. Joseph County located within the Pigeon River project area.

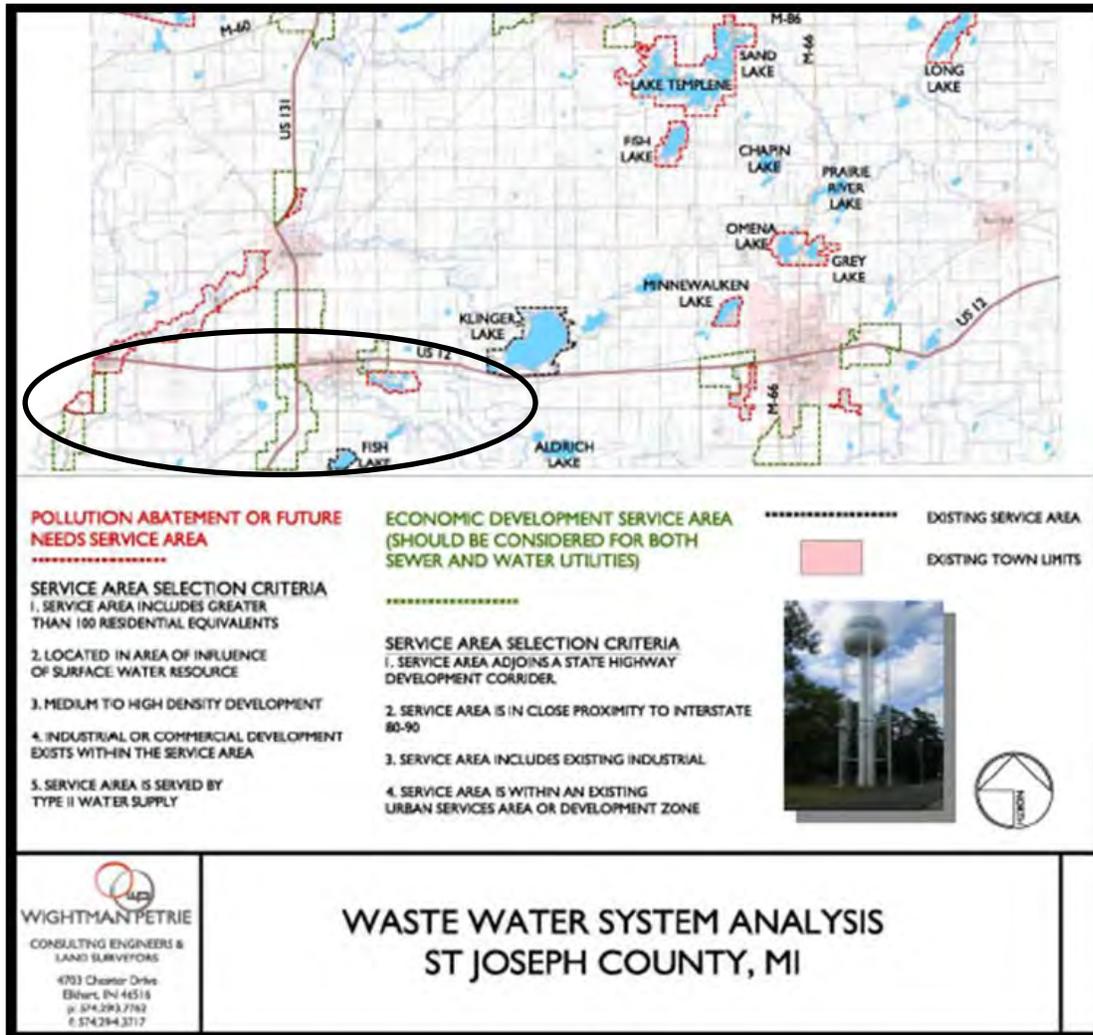


Figure 12: St. Joseph County Projected Wastewater Treatment Expansion

LaGrange County Comprehensive Plan

On December 6, 2010, the LaGrange County released their Comprehensive Plan. The Plan consists of two major subsections; the Planning Foundation and the Land Use Plan. The Planning Foundation takes natural resources into account, recognizing the uniqueness of the landscape of the county, where the Land Use Plan outlines strategies to limit the impact of urban sprawl and other construction activities on the natural environment. Goals and concerns outlined in the Plan that relate to the concerns of stakeholders in the watershed are:

- “New development will be built in a manner that maintains the integrity of the natural environment”
- “Water and water quality are valuable resources to the county both as a source of recreation and lifestyle but also as a life necessity”
- “...Urban sprawl will be minimized”
- “...poorly installed groundwater wells, placement of waste removal systems, improper manure management, or uncontrolled storm water runoff can create safety hazards...”

- “Encourage commercial uses, which are not associated with homes or farms, to locate on paved roadways”
- “Development of residential uses should be permitted at densities not to exceed two units per acre where adequate sanitary sewer services are available...housing units that have no access to sanitary sewer services should be restricted to one unit per acre...”

LaGrange County recognizes the value of the lake system and natural resources they have available in the county and have planned for their preservation to the best of their ability in the County Comprehensive Plan.

LaGrange County Parks Department Master Plan

The LaGrange County Parks Department developed a five year LaGrange Parks Master Plan in 2008. LaGrange County manages eleven parks labeled in Figure 13, which was taken directly from the Parks Master Plan. Of the eleven parks in the Plan, four are located within the Pigeon River project area; Shishewana Lake Beach (2 acres), Scott Mill Park (120 acres), Pine Knob Park (59 acres), and the largest of the LaGrange County Parks, Maple Wood Park/LaGrange County Nature Preserve (131 acres). Parks are an important asset in any community as it provides a place for residents to get outdoors and explore nature, engage with the community, and learn about the natural environment. Parks are also an asset to water quality as parks provide “green spaces” which help to filter storm water runoff from urban areas, and limit the amount of storm water draining directly into the municipal sewer system.

There are two main goals of the LaGrange County Parks Department which are relevant to this WMP; 1) “wisely use and preserve the county’s natural resources, parks, and facilities” and 2) “expand recreational opportunities in LaGrange County”. These two goals correspond with the desires of LaGrange County residents according to a survey taken by the Parks Department before the release of the Master Plan. As a result of the survey, a priority exclaimed in the Master Plan is to “Maintain quality natural plant communities, wetlands, bogs, prairies, etc...” and a goal was added to include providing “...a variety of recreational, historical, and educational programming that focuses on our natural resources and parks.” Both goals, if accomplished will greatly increase the public’s awareness of natural resource issues.

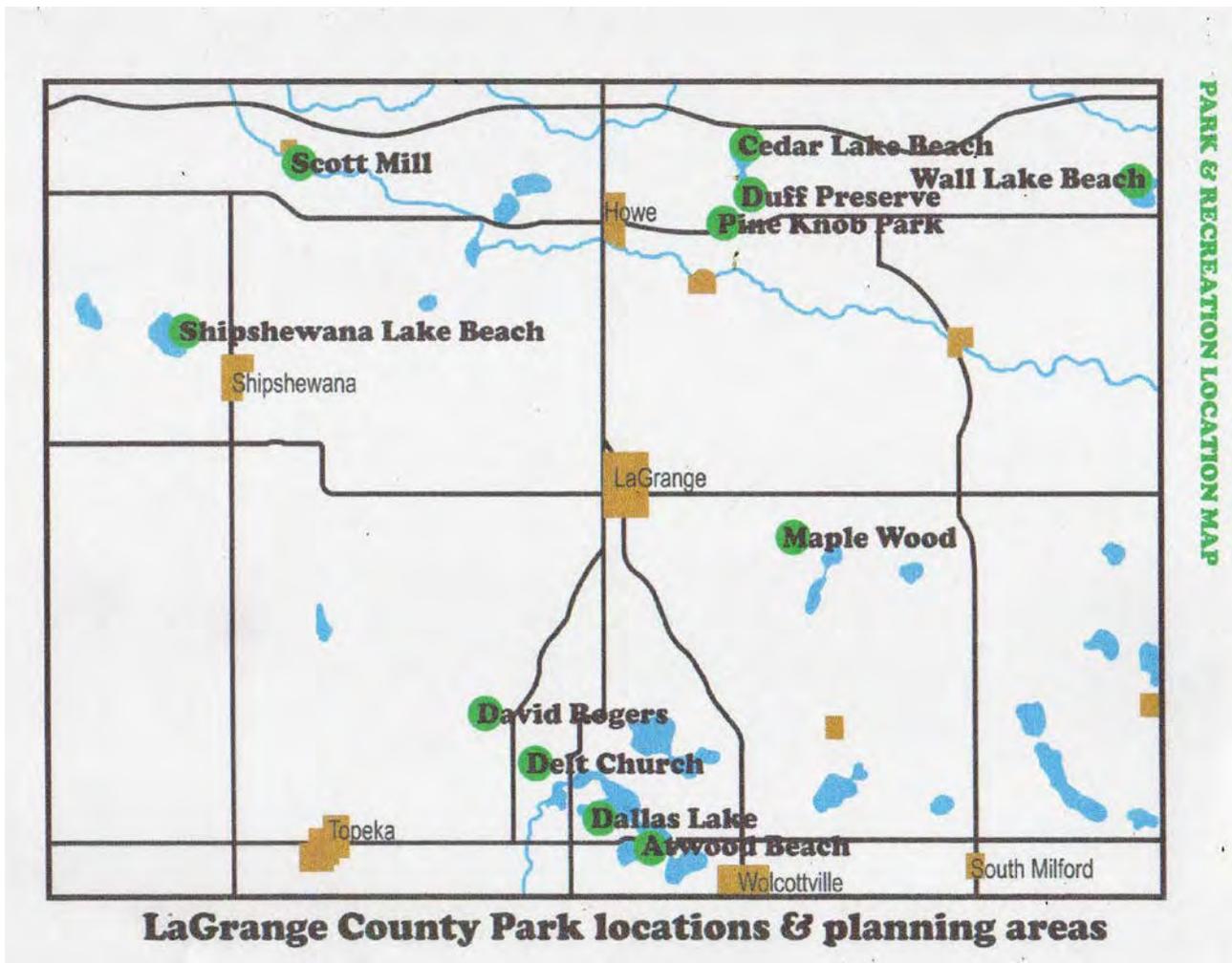


Figure 13: LaGrange County Managed Parks

There are no communities located within the project area that have combined sewer outfalls. Combined sewer outfalls can pose a serious threat to surface waters as they are sewers that collect rainwater runoff, domestic sewage, and industrial waste in the same pipe. Typically all the water is treated at a waste water treatment plant (WWTP), however during periods of heavy rain or snowmelt, the WWTP cannot treat the large volume of water entering the plant and much of it bypasses the WWTP and is discharged directly into a waterway. The town of LaGrange used to have combined sewers but recognized this as a problem and updated the sewer system in 2003, prior to the requirement for a Long Term Control Plan, and eventual implementation, by the State.

Most of the population in the project area receives their drinking water from the vast supply of ground water present in the area. In fact, LaGrange County is ranked second in Indiana for supplying drinking water via ground water. There are nine community public water supply systems (CPWSS) in the project area (three in St. Joseph County, MI and six in LaGrange County, IN) which draw their water through groundwater wells. A CPWSS is designated as such if it has 15 service connections or supplies drinking water to at least 25 people, according to the federal

Safe Drinking Water Act. In Indiana a CPWSS, the entity controlling the system, is required to develop a Wellhead Protection Plan (WHPP); it is a voluntary process in Michigan. A WHPP must contain seven elements according to the MI Department of Environmental Quality, which is more stringent than IDEM’s requirements; 1) Roles and Responsibilities of those involved in the WHPP, 2) Wellhead Protection Area Delineation of where ground water is being drawn from, 3) Potential Sources of Contamination to identify known and potential areas of contamination within the wellhead protection area, 4) Wellhead Protection Area Management to provide ways to reduce the risks found in step three, 5) Contingency Plan in case of a water supply emergency, 6) New Wells to identify the ability to meet existing and future water needs will be examined, and 7) Public Education and Outreach to outline a plan to educate the public on ground water quality and wellhead protection.

Indiana has two phases of wellhead protection. Phase I is the development of the WHPP and Phase II is the first WHPP update; one is required every five years from Phase II on. All communities located within LaGrange County have completed Phase I of the requirement and are slated to be working on Phase II. One community in St. Joseph County, White Pigeon, is currently in the work plan stage of the project, which is when they begin delineating the 10 year time of travel for water within the aquifer in question. According to the wellhead protection program of the MI DEQ, White Pigeon is currently not doing any work on their WHPP. There are two mobile home parks in St. Joseph County which should develop a work plan, but have not yet begun the planning process. Table 13 identifies those CPWSSs located within the project area and which phase they are currently in.

Table 14: Wellhead Protection Plans in Process

System Name	Population	Phase	Approval Date	Next Phase Due Date (if known)
Lakeside Manor Mobile Home Park	215	Phase I	8/2/2004	8/2/2014
LaGrange Department of Water Works	2919	Phase I	10/5/2005	10/5/2015
Shipshewana Water Works	536	Phase I	9/15/2003	9/14/2013
Pioneer Country Estates	60	Phase I	10/5/2004	10/5/2014
Autumn Grove	55	Phase I	2/23/2007	2/23/2017
Hickory Grove Mobile Home Park	25	Phase I	6/16/2004	6/16/2014
White Pigeon	1640	Work Plan	N/A	Unknown
River Forest Mobile Home Park	140	N/A	N/A	Unknown
White Pines Mobile Home Park	90	N/A	N/A	Unknown

The federal Clean Water Act requires storm water discharges from larger urbanized areas to be permitted under the National Pollutant Discharge Elimination System (NPDES) program. These communities are referred to as Municipal Storm Sewer System (MS4) Communities and are required to develop a Storm Water Quality Management Plan.

Elkhart County is the only entity located within the project area designated as an MS4 community. IDEM describes a MS4 as “a conveyance or system of conveyances owned by a

state, city, town, or other public entity that discharges to waters of the United States and is designed or used for collecting or conveying storm water.” The reason that MS4s are required is that urban storm water runoff has one of highest potentials for carrying pollutants to our waterways and as such, the Federal Clean Water Act requires that certain storm water dischargers acquire a National Pollutant Discharge Elimination System (NPDES) permit. Being a MS4 community, Elkhart County was required to develop a Storm Water Quality Management Plan (SWQMP) for the cities of Goshen and Elkhart. However, proactively, the county government extended the boundaries of the Plan to include the entire Elkhart County. The SWQMP must include six management techniques, referred to as “minimum control measures” (MCMs) including; 1) Public education and outreach; 2) Public participation and involvement; 3) Illicit discharge, detection and elimination; 4) Construction site runoff control; 5) Post-construction site runoff control; and 6) Pollution prevention and good housekeeping. Essentially, the MCMs list several management practices to limit the amount of storm water entering the sewers on a regular basis. Since the portion of the Pigeon River Watershed project area that is located within Elkhart County is exclusively rural, the SWQMP does not contain any MCMs relevant to this project.

2.8 Endangered and Threatened Species

The Pigeon River watershed is home to many federally and state listed endangered and threatened species. The US Fish and Wildlife Service (USFWS) maintains a database of those species that are either endangered or candidates to become endangered on the federal level which can be seen in Table 15. Two species of significance are the Indiana Bat and the Eastern Massassauga rattlesnake, both of which rely on wetland and upland forested areas for habitat. According to the USFWS, the Indiana Bat population has decreased by over half since it was originally listed as endangered in 1967. This decrease in population can be attributed to human activities disturbing the Indiana Bat’s habitat. The reason the bats population has declined in northern Indiana is mainly due to their breeding and feeding grounds, riparian and upland forests, being cleared for agricultural purposes and expanding urban areas. The Massassauga Rattlesnake is endangered due to the clearing of its wetland habitat for agricultural purposes.

Table 15: Federally listed Endangered Species

County	Species	Common Name	Status	Habitat
Birds				
St. Joseph (MI)	<i>Numenius borealis</i>	Eskimo Curlew	Endangered	Open fields of grasses, sedges, and low shrubs
MAMMALS				
DeKalb, Elkhart, LaGrange, Noble, Steuben, St. Joseph (MI)	<i>Myotis sobalis</i>	Indiana Bat	Endangered	Hibernation in caves, swarming in wooded areas and stream riparian corridors
St. Joseph (MI)	<i>Canis lupus</i>	Gray Wolf	Threatened	Forests
MUSSELS				
DeKalb, St. Joseph (MI)	<i>Pleurobema clava</i>	Clubshell	Endangered	Rivers
DeKalb, St. Joseph (MI)	<i>Epioblasma torulosa rangiana</i>	Northern riffleshell	Endangered	Rivers
DeKalb	<i>Villosa fabalis</i>	Rayed Bean	Proposed as Endangered	Smaller headwater creeks, sometimes larger rivers
DeKalb, St. Joseph (MI)	<i>Epioblasma obliquata perobliqua</i>	White cat's paw pearlymussel	Endangered	Rivers
INSECTS				
LaGrange	<i>Neonympha mitchellii mitchellii</i>	Mitchell's satyr butterfly	Endangered	Fens
St. Joseph (MI)	<i>Nicrophorus americanus</i>	American burying Beetle	Endangered	Oak-pine woodlands, forests grasslands, prairies (feeding generalists)
St. Joseph (MI)	<i>Brychius hungerfordi</i>	Hungerford's crawling water beetle	Endangered	Cool riffles of clean, slightly alkaline waters

County	Species	Common Name	Status	Habitat
REPTILES				
Steuben, St Joseph (MI)	<i>Nerodia erythrogaster neglecta</i>	Copperbelly water snake	Threatened	Wooded and permanently wet areas such as oxbows, sloughs, brushy ditches and floodplain woods
Elkhart, LaGrange, Noble, Steuben, St. Joseph (MI)	<i>Sistrurus c. catenatus</i>	Eastern Massasauga	Candidate	Wetlands and adjacent uplands
PLANTS				
St. Joseph (MI)	<i>Plantanthera leucophaea</i>	Eastern prairie fringed orchid	Threatened	Mesic to wet prairies and meadows
St. Joseph (MI)	<i>Asplenium scolopendrium</i> var. <i>americanum</i>	American hart's tongue Fern	Threatened	Neutral and lime rich substrates
St. Joseph (MI)	<i>Platanthera leucophaea</i>	Small whorled Pogonia	Threatened	Older hardwood stands of beech, birch, maple, oak, and hickory with an open understory

The IN DNR, Division of Nature Preserves maintains a list of federally and state endangered and threatened species. The list also contains species that are considered rare, extirpated, of special concern, significant, and on a watch list for the state.

2.9 Summary of Project Area Inventory

All of the elements described above, when overlapped, can provide a larger picture of how the watershed functions and what activities may pose a greater threat to our water resources. This section will summarize all the characteristics of the project area and describe how they relate to each other. This will be examined more closely in subsequent sections.

Despite the low rolling hills of the project area, the predominant land use is agriculture, either row crops or pasture and hay fields, and many of the soils in the area are considered to be HEL or PHEL. For this reason, it is important that special precautions be taken by those producers working that land to limit the amount of soil erosion. As soil erodes, it can increase stream and lake sedimentation. The eroding soil particles often carry nutrients that bind to the particles to open water sources as well. This may cause an increase in phosphorus and nitrogen levels within the water system, leading to unsuitable water quality.

The major population centers within the project area are the only areas where sanitary sewer treatment facilities are in use: LaGrange is serviced by the LaGrange Waste Water Treatment Plant, which uses an oxidation ditch to treat the sewage; Shipshewana and Shipshewana Lake are serviced by the Shipshewana Waste Water Treatment Plant which also uses an oxidation ditch to treat the sewage. Several lake communities in the area are serviced by the LaGrange County Regional Utility District Region B and Region F. Region F services Fish and Royer Lake which uses an innovative wetland sewage treatment system. However, this leaves the majority of the rural areas, and some lake communities, to treat their sewage with on-site systems. With the expansive aquifer under the project area, high water table, and nearly every soil type in the project area being rated as not suitable for septic system usage, there is a serious risk to both ground and surface water. If the ground water becomes contaminated by septic leakage, the drinking water supply within the project area is at risk of becoming polluted and unsafe for consumption.

As stated earlier, the majority of the land within the project area is used for agriculture and many of the wetlands that were once present have been drained for pasture land or row crops. However, wetlands play an important role in our ecosystem, not only as flood water traps and pollution sinks, but also as prime habitat for many of the species listed as endangered or threatened. For instance, the Indiana Bat, Mitchell's Satyr Butterfly, Copperbelly Watersnake, Massasauga Rattlesnake, and Eastern Prairie Fringed Orchid all prefer the habitat provided by wetlands. Forest land, much of which has been cleared for agriculture, also is vital for more keystone endangered species, such as the Grey Wolf. Leaving some agricultural land fallow and letting that landscape return to forest or wetland will provide more vital habitat for those endangered and threatened species.

Table 16, below, links those concerns that stakeholders from the public meetings had regarding the project area and water resources to evidence found during the initial project area inventory. More evidence will be provided in subsequent sections at the 12 digit HUC level.

Table 16: Stakeholder Concerns and Relevant Evidence for Concern

Concerns	Evidence	Potential Problem
Livestock access to open water	Amish farms which would have at a minimum 2 buggy horses. Many of these farms use the ditches and streams as a drinking water source for their livestock.	<i>E. coli</i> contamination, excess nutrients, impaired biota, streambank erosion and sediment
Stormwater runoff from barnyards	15 CFO/CAFOs in the watershed and many small Amish farms which would have at a minimum 2 buggy horses. The gently rolling hills of the landscape would allow for more runoff to occur.	<i>E. coli</i> contamination, excess nutrients, impaired biota, and sediment
Increase in impervious surfaces	15 built-up lakes which increases the number of driveways, patios, and access roads. Expansion of urban centers (LaGrange and Shipshewana).	Oil and grease, sediment, and nutrients
Fertilizer used on urban lawns	15 built-up lakes in the project area. Many lake residences have lush and green lawns which indicate the use of commercial fertilizers.	Excess nutrients and impaired biotic communities
Lakes in the area becoming more built-up	15 built-up lakes, many with onsite sewage treatment systems placed in soil unsuitable for septic systems. Also, increase in imperviousness around lakes allowing direct runoff from driveways, patios and access roads.	Excess sediment, nutrients and impaired biotic communities, <i>E. coli</i>
Septic system discharge	There are not enough sanitary sewer treatment facilities to handle all residents living in rural areas. Nearly all soils are rated as “very limited” for septic system usage.	Excess nutrients, <i>E. coli</i>
Horse manure on public roads	Large Amish population in the project area.	<i>E. coli</i> contamination, excess nutrients